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RELAP/MOD3.2 Assessment Using an 11% Upper Plenum Break Experiment in the PSB Facility

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ABSTRACT

The RELAP/MOD3.2 computer code has been assessed using an 11% upper plenum break experiment in the PSB test facility at the Electrogorsk Research and Engineering Center. This work was performed as part of the U.S. Department of Energy's International Nuclear Safety Program, and is part of the effort addressing the capability of the RELAP5/MOD3.2 code to model transients in Soviet-designed reactors.

Designated VVER Standard Problem PSBV1, the test addressed several important phenomena related to VVER behavior that the code needs to simulate well. The code was judged to reasonably model the phenomena of two-phase flow natural circulation in the primary coolant system, asymmetric loop behavior, leak flow, loop seal clearance in the cold legs, heat transfer in a covered core, heat transfer in a partially covered core, pressurizer thermal-hydraulics, and integral system effects. The code was judged to be in minimal agreement with the experiment data for the mixture level and entrainment in the core, leading to a user recommendation to assess the sensitivity of transient calculations to the interphase drag modeling in the core. No judgments were made for the phenomena of phase separation without mixture level formation, mixture level and entrainment in the steam generators, pool formation in the upper plenum, or flow stratification in horizontal pipes because either the phenomenon did not occur in the test or there were insufficient measurements to characterize the behavior.

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ACRONYMS

ACC	accumulator
CCFL	countercurrent flow limitation
ECC	emergency core coolant
ECCS	emergency core cooling system
EREC	Electrogorsk Research and Engineering Center on Nuclear Plants Safety
HPI	high pressure injection
INEEL	Idaho National Engineering and Environmental Laboratory
INSP	International Nuclear Safety Program
RBMK	boiling water-cooled, graphite-moderated reactor
SG	steam generator
VVER	water-cooled, water-moderated energy reactor

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1. INTRODUCTION

The RELAP5/MOD3.2 computer code is being investigated to determine its applicability for modeling transients in Soviet-designed reactors. Part of that investigation includes assessment of the code using experiment data. Such an assessment has been performed using data from the PSB facility at the Electrogorsk Research and Engineering Center for Nuclear Plants Safety (EREC).

This work has been undertaken as part of Joint Project #6, "Verification of Software with Respect to VVER and RBMK Reactors," of the U.S. Department of Energy's International Nuclear Safety Program (INSP). Russian experts and scientists from the United States are collaborating in the code assessment process. The specific experiment being used for this study was an 11% break in the upper plenum, which is a counterpart to an earlier experiment performed in the ISB facility. That earlier experiment was analyzed as VVER Standard Problem #5 in the INSP code validation effort; the current test is designated as Standard Problem PSBV1.

1.1 Important Phenomena

Reference 1 identifies the transient phenomena that are important for any code to be able to model well in order to provide confidence in the simulation of VVER transient behavior. The standard problem definition report[2] identifies the following phenomena as being addressed by this experiment:

- Two-phase flow natural circulation in the primary coolant system
- Asymmetric loop behavior
- Leak flow
- Separation of phases without mixture level formation
- Mixture level and entrainment in the steam generators
- Mixture level and entrainment in the core
- Flow stratification in horizontal pipes
- Loop seal clearance in the cold legs
- Pool formation in the upper plenum
- Heat transfer in a covered core
- Heat transfer in a partially uncovered core
- Pressurizer thermal-hydraulics

- Integral system effects.

1.2 Code Capability Determination

Judgments regarding code fidelity were made based on the code/data comparisons presented in this report. These judgments were based on the application of a standardized, consistent, and qualitative set of criteria. The terminology of these criteria is defined below.

"Excellent agreement" applies when the code exhibits no deficiencies in modeling a given behavior. Major and minor phenomena and trends are correctly predicted. The calculated results are judged to agree closely with the data. The calculation will, with few exceptions, lie within the uncertainty bands of the data. The code may be used with confidence in similar applications. (The term "major phenomena" refers to the phenomena that influence key parameters such as fuel rod cladding temperature, pressure, differential pressure, mass flow rate, and mass distribution. Predicting major trends means that the prediction shows the significant features of the data. Significant features include the magnitude of a given parameter through the transient, slopes, and inflection points that mark significant changes in the parameter.)

"Reasonable agreement" applies when the code exhibits minor deficiencies. Overall, the code provides an acceptable prediction. All major trends and phenomena are correctly predicted. Differences between calculation and data are greater than deemed necessary for excellent agreement. The calculation will occasionally lie outside the uncertainty bands of the data. However, the correct conclusions about trends and phenomena would be reached if the code were used in similar applications. The code models and/or facility model noding should be reviewed to see if improvements can be made.

"Minimal agreement" applies when the code exhibits significant deficiencies. Overall, the code provides a prediction that is only conditionally acceptable. Some major trends or phenomena are not predicted correctly, and some calculated values lie considerably outside the uncertainty bands of the data. Incorrect conclusions about trends and phenomena may be reached if the code were used in similar applications, and an appropriate warning needs to be issued to users. Selected code models and/or facility model noding need to be reviewed, modified, and assessed before the code can be used with confidence in similar applications.

"Insufficient agreement" applies when the code exhibits major deficiencies. The code provides an unacceptable prediction of the test. Major trends are not predicted correctly. Most calculated values lie outside the uncertainty bands of the data. Incorrect conclusions about trends and phenomena are probable if the code is used in similar applications, and an appropriate warning needs to be issued to users. Selected code models and/or facility model noding need to be reviewed, modified, and assessed before the code can be used with confidence in similar applications.

Assessment findings of “excellent” or “reasonable” indicate that the code can model those phenomena acceptably.

Subsequent sections of the report present a description of the test facility and experiment, the RELAP5 code and test facility input model, the assessment results, the conclusions reached in the assessment study, and references.

2. FACILITY AND TEST DESCRIPTION

Standard Problem PSBV1 is based on an 11% upper plenum break in the PSB-VVER test facility. The facility and the specific test are described in the following subsections.

2.1 Experiment Facility

The PSB-VVER facility (see Figure 1) is a full-height scale model of a VVER-1000 reactor that is approximately 1/300 scale in volume and power. The facility has four coolant loops. The pressurizer surge line is connected to two of the hot legs, with only one flow path being used in a given experiment. Emergency core coolant (ECC) injection is provided by four accumulators and by an active pump simulating the high- and low-pressure injection system pumps. All system components are insulated from the environment with glass wool insulation, but during initial steady state operation about 3.4% of the input heat is lost to the environment.

The internals of the VVER vessel are represented in the facility by separate pipes for the downcomer, the core and upper plenum, and the core bypass. A horizontal pipe connects the lower portion of the downcomer to the core and core bypass pipes. There is also a small pipe connecting the top of the downcomer to the upper plenum. The core contains 168 full height hollow fuel rod simulators (hereinafter, heater rods) with a uniform power profile and a center unheated rod. About 3% of the downcomer flow is diverted through the core bypass instead of going through the core. Special flow restrictors, each consisting of a plate with 2 holes of 7 mm diameter, were inserted at either end of the core bypass section. The bypass section is heated over the same elevation range as the core but only receives about 1% of the core power.

Each coolant loop includes a hot leg, steam generator, pump suction piping, pump, and cold leg. The primary side of each steam generator contains hot and cold collectors, and 27 steam generator tubes. Each tube is a coil with ten complete turns, inclined slightly downward from the hot collector to the cold collector. The secondary side has a feedwater ring in the plenum above the steam generator tubes, and no separate downcomer region. The four steam generators are connected to a common steam header. Feedwater flow to the steam generators is not continuous. Flow is provided when needed to keep the water level within the desired operating band.

The break was located in a special pipe connected to the upper plenum. An insert with an inner diameter of 16 mm and a length-to-diameter ratio of 10 was installed in the 45-mm diameter break piping. A valve downstream of the insert was opened to initiate the transient.

Cylinders in the downcomer and upper plenum are used to separate the ECC flows from the break and the hot and cold leg nozzles. The break piping and hot and cold legs are connected to the outer walls of the upper plenum and downcomer. The ECC is connected to the inside of these cylinders, providing a barrier to immediate bypass of the ECC flow into the loop piping or out the break.

2.2 Test Procedure

The 11% upper plenum break represented a rupture of an emergency core cooling system (ECCS) injection line. The ECCS equipment available for this experiment was high pressure injection (HPI) to the loop 4 hot leg and all four accumulators.

The experiment was initiated from steady state conditions by opening the break. The electrical power supplied to the heater rods and the core bypass heaters was reduced to simulate reactor scram. Following

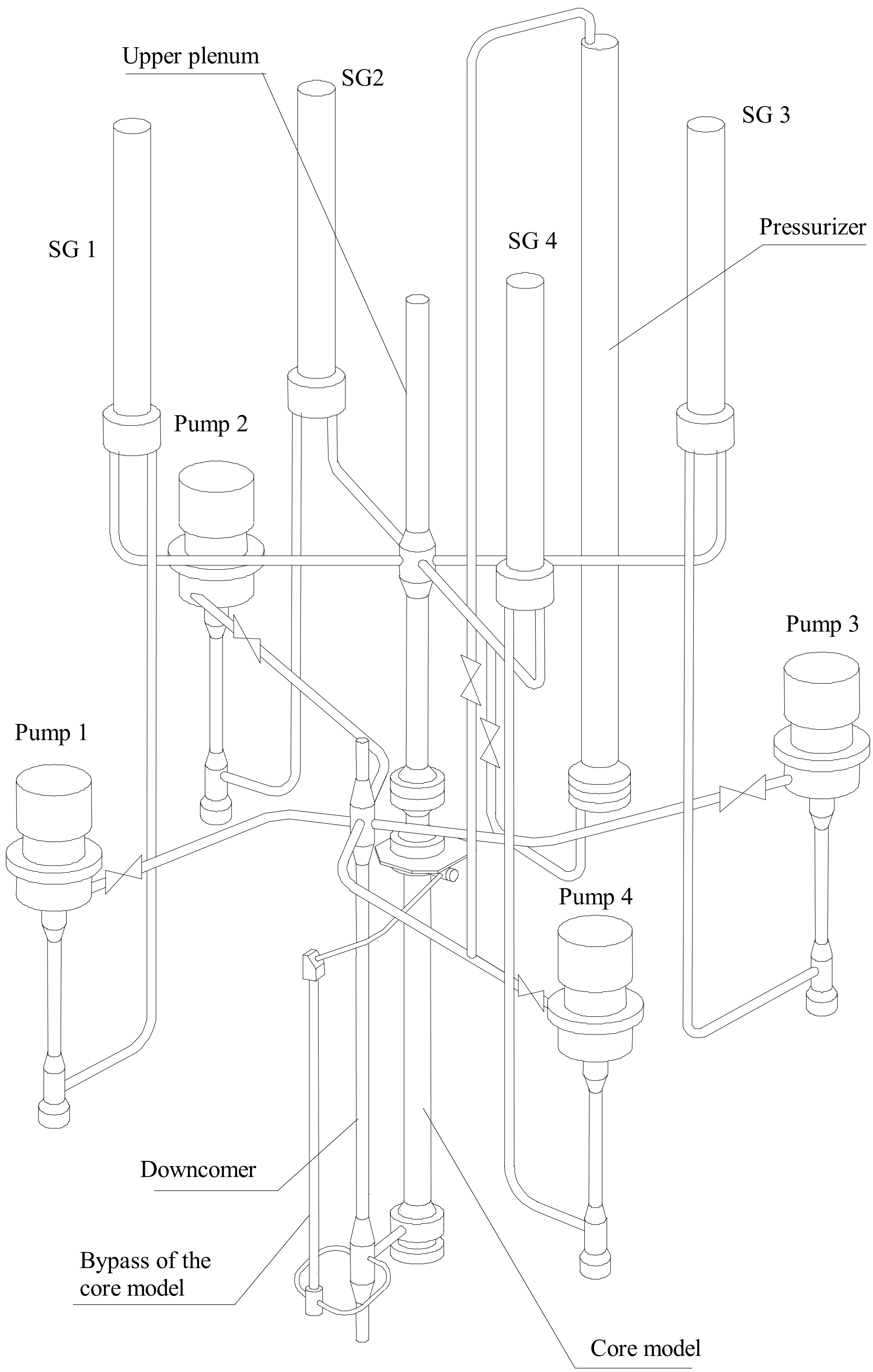

Figure 1. General view of the PSB facility.

the simulated scram, feedwater flow to the steam generators was stopped, and the steam line isolation valves were closed. The main circulation pumps were tripped near 10 s. High pressure injection flow was initiated at an upper plenum pressure of 10.5 MPa, providing coolant flow to the loop 4 hot leg. The transient was then allowed to progress until elevated temperatures were measured in the core and core bypass structures. When the core bypass structure temperature reached 673 K, the bypass heaters were de-energized. Power to the core was turned off at 1037 s, terminating the test, when the peak measured heater rod temperature was near 1100 K.

3. CODE AND INPUT MODEL DESCRIPTION

The RELAP5/MOD3.2 code and input model used for the assessment calculations are described below. Also addressed are the initial and boundary conditions used for the transient calculations.

3.1 RELAP5/MOD3.2

The RELAP5/MOD3.2 computer code[3] was developed at the Idaho National Engineering and Environmental Laboratory (INEEL) for use in analyzing transients in light water reactors. It can be used for simulating a wide variety of system transients of interest in reactor safety. The core, primary system, secondary system, feedwater train, and system controls can be simulated.

RELAP5/MOD3.2 uses a one-dimensional, two fluid, nonequilibrium, six equation hydrodynamic model with a simplified capability to treat multi-dimensional flows. This model provides continuity, momentum, and energy equations for both the liquid and the vapor phases within a control volume. The energy equation contains source terms which couple the hydrodynamic model to the heat structure conduction model by a convective heat transfer formulation. The code contains special process models for critical flow, abrupt area changes, branching, crossflow junctions, pumps, accumulators, valves, core neutronics, and control systems. A countercurrent flow limitation model can also be applied at vertical junctions. The reflood model does not work properly in this version of the code.

The code has been developed to run on a variety of computing platforms, from mainframes to personal computers. Configuration control is maintained on all versions of the code developed at the INEEL.

3.2 RELAP5 Input Model

All of the major features of the experiment facility were included in the RELAP5 input model. Each of the four coolant loops included a hot leg, steam generator, pump suction loop seal piping, main coolant pump, and a cold leg. The downcomer, core, core bypass, upper plenum, and bypass piping between the downcomer and upper plenum were also included in the model. The pressurizer was modeled, with surge lines connecting to two of the hot legs. The secondary side of the steam generators included main and auxiliary feedwater, individual steam lines and the common steam header. High pressure injection flow was provided to the loop 4 hot leg, and four accumulators provided flow to the downcomer and upper plenum (two to each location). Relief valves were included on the pressurizer and each of the steam lines. Figure 2 provides a nodalization diagram for the model, showing the reactor vessel components and one coolant loop with the pressurizer; the other three loops have identical nodalizations, except that two loops are not connected to the pressurizer. The model contains 534 volumes, 557 junctions, and 521 heat structures with 5549 mesh points. Standard modeling guidelines were followed in developing the nodalization of the system. The nodalization approach was peer reviewed. Appendix A provides a listing of the input model.

The steam generator secondary side is modeled with a single stack of volumes in the tube bundle region. There is no physical barrier between the tube bundle and the outer shell of the steam generator, and attempts to model a downcomer region separate from the riser, with crossflow junctions between them, resulted in unphysical flow rates.

The heat transfer coefficient on the inside of the steam generator tubes was increased by 20% by using a fouling factor of 1.2. This was done to estimate the convective heat transfer enhancement caused

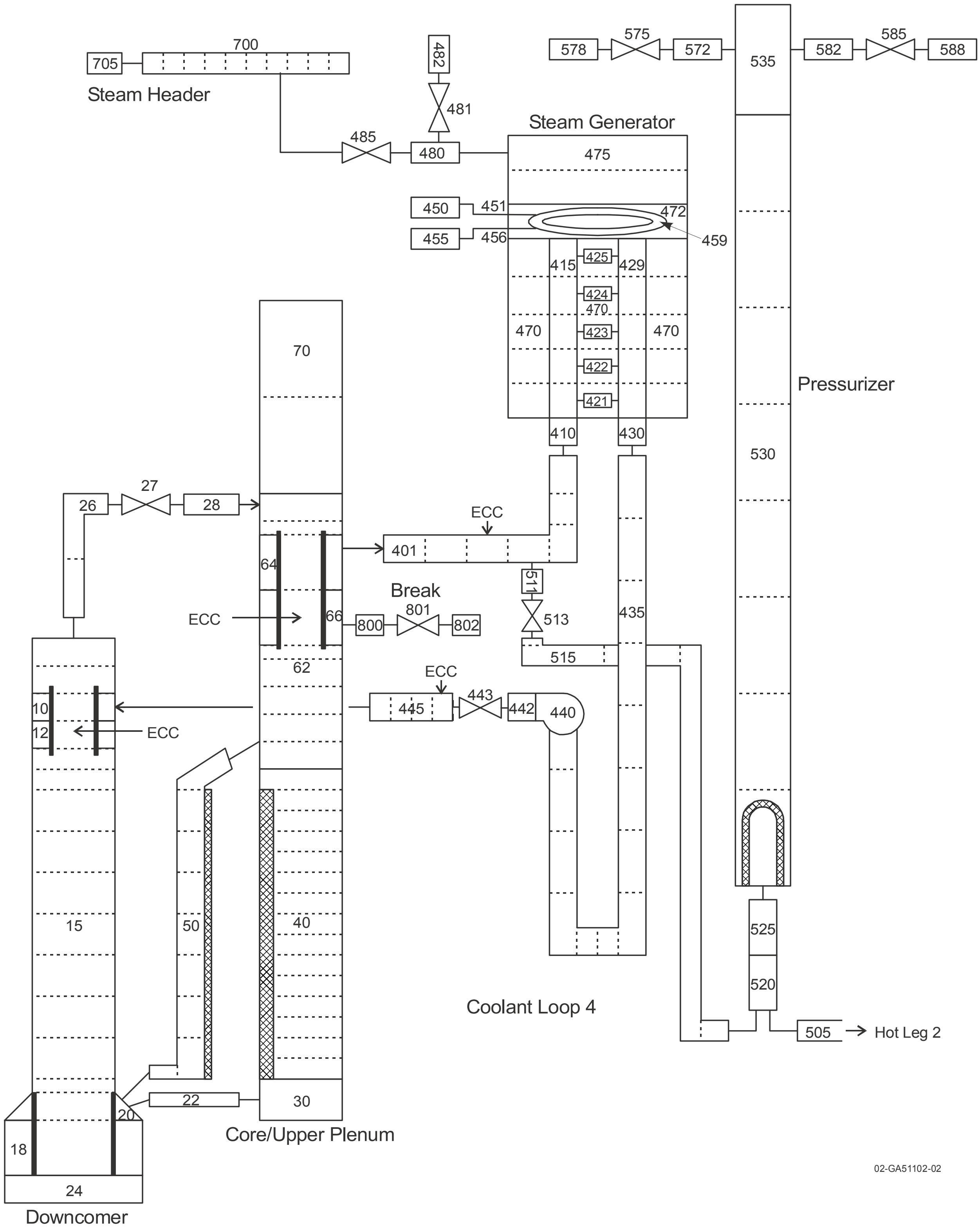

Figure 2. Nodalization of the PSB reactor vessel, pressurizer, and one coolant loop.

by the coiled tubes,[4] because the wall heat transfer model available in RELAP5 was developed for straight tubes.

No data were available on the pump performance, so built-in data for Westinghouse pumps were used. No two-phase degradation was modeled because no appropriate data were available; this is not expected to affect the transient behavior because the pumps coast down very quickly (~4 s) after being tripped.

There was no measurement of the flow through the core bypass. The loss coefficients through the bypass flow path were adjusted during the steady state calculation so that the calculated coolant temperature at the top of the core bypass matched the measured value of 570 K (measurement YC01T03).

Choking was turned off at most of the junctions, as recommended in the code user guidelines. Exceptions were the break, at valves, at the pressurizer connection to the surge line and the surge line connections to the hot leg, and at the core outlet. The break piping was attached to the upper plenum one volume below the hot leg connections. The break was modeled as an abrupt area change with user-input loss coefficients of 1.465 (calculated for the break geometry). No characterization data were available for the break geometry. Based on previous experience, a subcooled discharge coefficient of 0.80 was used; the saturated and superheated discharge coefficients were left at the default value of 1.0.

The RELAP5/MOD3.2 countercurrent flow limitation (CCFL) model was applied at five locations in the model: in the downcomer below the accumulator injection nozzles, at the core outlet, in the upper plenum below the accumulator injection nozzles, at the plate between the upper plenum and the upper head, and at the outlet of the riser section on the secondary side of the steam generators. These junctions were selected because they were vertically oriented, represented places where the flow area changed, and modeled regions of the facility where CCFL might be expected to occur.

The heat loss from the primary and secondary was represented in the RELAP5/MOD3.2 model by entering the thickness of the insulation on the outside of all the pipes and other system components. Appropriate material properties were input for the insulation. A constant boundary temperature was applied. The heat transfer coefficient on the outer surface of the insulation was determined from model benchmarking calculations using heat loss data from the facility.[5]

3.3 Initial and Boundary Conditions

A steady state calculation was performed to establish the desired initial conditions in the PSB facility model for the transient calculation. Results from this calculation are compared to the values from the experiment in Table 1. Except for the steam generator pressures, all of the calculated initial conditions were in good agreement with the measured values. The steam generator pressures are lower than the measured values. In the steady state calculation, the steam header pressure was adjusted to achieve the desired reactor vessel inlet temperature; the resulting pressure required to remove the heat from the tubes was lower than in the experiment. This is likely the result of not having appropriate, specific heat transfer correlations for the coiled geometry of the steam generator tubes. The accumulator levels and pressures are also slightly different in some cases. The measured values in the table were taken from the experiment data report,[6] while the RELAP5 input model initial values were adjusted to match the initial values from the electronic data file.

The initial conditions for the test were not all steady. For example, the feedwater flow to the steam generators was not continuous in the facility. Intermittent flow was used to keep the liquid level within a desired band. By contrast, a steady feedwater flow was maintained to keep the level constant at the

Table 1. Measured and calculated initial conditions for the PSB 11% upper plenum break experiment.

Parameter	Measured	Calculated
Upper plenum pressure (MPa)	16.9	16.9
Downcomer inlet temperature (K)	559.7	559.7
Upper plenum outlet temperature (K)	589.7	589.5
Core power (kW)	1520	1520
Core bypass power (kW)	17.4	17.4
Pressurizer level[a] (m)	6.99	6.99
Loop flow (kg/s)		
Loop 1	2.3	2.3
Loop 2	2.3	2.3
Loop 3	2.3	2.3
Loop 4	2.4	2.4
Liquid level (m)		
Steam generator 1	1.71	1.71
Steam generator 2	1.71	1.71
Steam generator 3	1.84	1.84
Steam generator 4	1.74	1.74
Pressure (MPa)		
Steam generator 1	7.43	7.17
Steam generator 2	7.47	7.17
Steam generator 3	7.33	7.17
Steam generator 4	7.43	7.17
Liquid level (m)		
Accumulator 1	4.84	4.83
Accumulator 2	4.84	4.84
Accumulator 3	4.86	4.86
Accumulator 4	4.85	4.84
Pressure (MPa)		
Accumulator 1	5.8	5.9
Accumulator 2	5.8	6.0
Accumulator 3	5.9	5.9
Accumulator 4	5.9	5.9

a. The specified pressurizer level is the reading from measurement YP01L02, whose lower tap is 1.885 m above the bottom of the pressurizer.

desired initial value in the RELAP5 calculation. The impact of the different approach in the calculation is that although the initial liquid level is at the desired value, the feedwater flow rate is different from the measured value in each of the steam generators. Since the steam generator secondary behavior is not significant in this transient, this anomaly is not expected to have a noticeable impact on the primary coolant system behavior.

The core power measured during the experiment was input as the power table in the RELAP5 calculation. The measured core bypass power was also input as a boundary condition, with the power being held constant at 11.6 kW until the maximum temperature in the core bypass piping reached 673 K; at that time, the power was turned off to protect the heater.

HPI flow and temperature were also input as boundary conditions for the calculation, based on the measured data; the HPI flow was a specified boundary condition for the test as well. HPI flow was started when the upper plenum pressure decreased to 10.5 MPa; in the calculation, a 0.7-s delay was included to account for signal processing time. The timing of the feedwater and steam valve closings in the input deck were also based on the measured data.

The transient calculations were terminated when the peak heater rod temperature reached 1073 K.

3.4 Calculation Information

The RELAP5 calculations were run on a DEC AlphaStation 600 computer. The semi-implicit solution scheme was used. The base case transient calculation ran 830 s of transient in 4112 s of cpu time. The calculated mass error in the primary coolant system was less than 0.5% of the total system coolant mass at the end of the calculation, indicating that the calculated response was not compromised by the accuracy of the numerical solution.

4. CODE ASSESSMENT

Once acceptable steady state conditions were established, transient calculations were undertaken. In addition to the base case calculation, several sensitivity calculations were performed to investigate certain aspects of the transient and code performance that were of particular interest.

Assessment judgments were made for the high-ranked phenomena believed to be addressed by this experiment. These phenomena were listed in Section 1, as were the assessment definitions and criteria.

4.1 Base Case

The behavior in the four loops was very similar. The discussions below will generally address only one loop, with the understanding that the same behavior was observed or calculated in the other three coolant loops. In those cases where different phenomena were observed, they will be presented.

Measured and calculated pressures in the upper plenum are presented in Figure 3. Table 2 provides the sequence of significant events for the experiment. A brief overview of the behavior observed in the experiment is provided here, then the comparisons between the data and calculations will be presented and discussed. Following the break opening, the system pressure decreased rapidly. The depressurization slowed near 50 s, as liquid began to boil in the core. As the pressure continued to decrease, accumulator injection began near 200 s. Condensation of some of the steam in the system by the cold ECC liquid caused the depressurization rate to increase. The ECC injection flow could not fully compensate for the break flow, allowing the core liquid level to drop low enough that the core began to heat up above the coolant saturation temperature. A cyclic behavior was then observed in the primary coolant system. The accumulator injection increased the depressurization rate because of steam condensing on the cold water

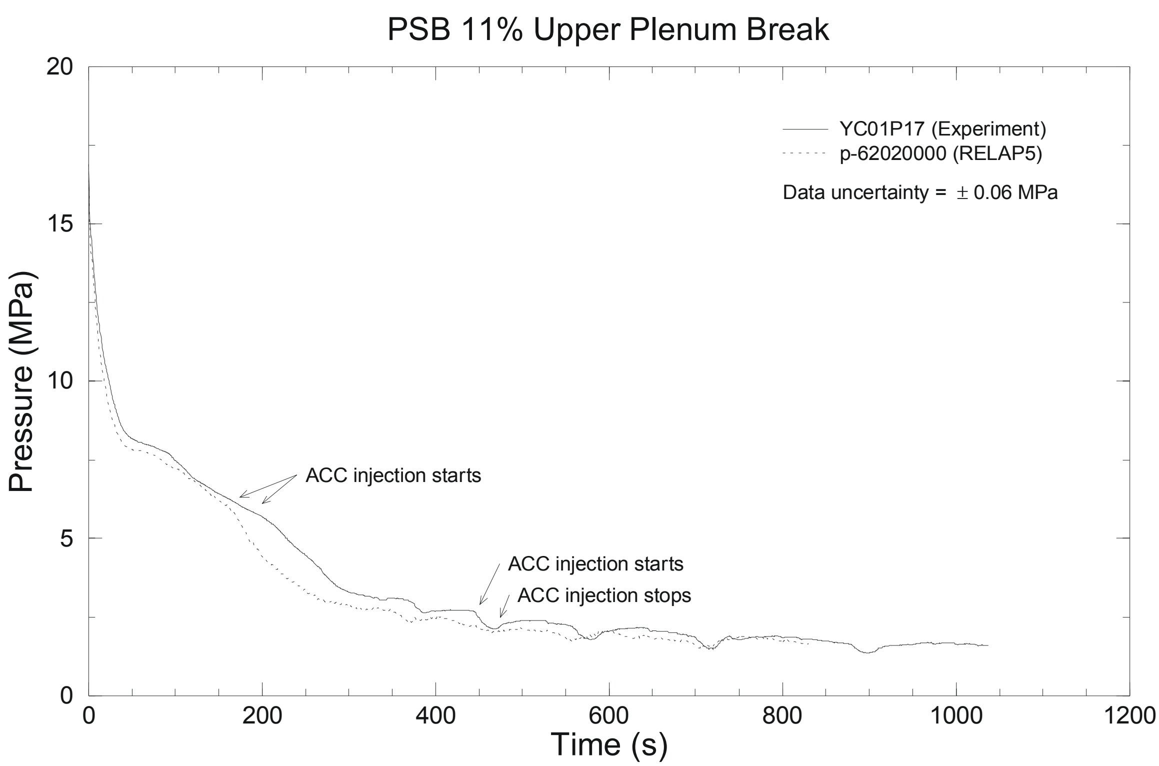

Figure 3. Upper plenum pressure for the base case.

Table 2. Sequence of events for the PSB 11% upper plenum break experiment.

Event	Time (s)	
	Data	Calculation
Break opens	0	0
Scram/power decrease	5	5[a]
Pressurizer heaters turned off	6	5
Main coolant pumps tripped	10	10[a]
Steam generator 4 feedwater flow ends	10	10[a]
Steam generator 1 feedwater flow ends	13	13[a]
Steam generator 3 feedwater flow ends	14	14[a]
Steam generator 2 steam flow ends	17	17[a]
Pressurizer above heaters empties (measurement YP01L02)	19	16
Steam generator 1 steam flow ends	20	20[a]
HPI starts	21	18
Steam generator 4 steam flow ends	23	23[a]
Steam generator 3 steam flow ends	24	24[a]
Primary pressure drops below secondary pressure	86	83
Accumulator 4 injection starts	165	163
Accumulator 2 injection starts	175	157
Accumulator 3 injection starts	184	163
Accumulator 1 injection starts	194	163
Core heatup starts	222	170
Core bypass heater tripped	559	--
Experiment terminated	1037	830

a. Specified boundary condition in the calculation, based on the experiment data.

being injected. This further increased the accumulator flow, refilling parts of the downcomer and core. As the liquid level in the core increased, the heater rods were quenched, and the increased vapor generation caused the pressure to increase, stopping accumulator injection. Without the accumulator injection, the liquid level in the core decreased, and the heater rods began to heat up again. The vapor generation rate was reduced because less liquid was available to boil, so the pressure decreased, allowing the accumulators to inject liquid again. This cyclic accumulator injection continued through much of the experiment, although the injection became less effective in stopping the core heatup; after 700 s, the injection was unable to completely quench the core. The test was terminated shortly after 1000 s to protect the heater rods, when the maximum heater rod temperature was near 1100 K.

The calculated pressure decreased a little more rapidly than was measured immediately after the break was opened, and again when accumulator injection began. The calculation exhibited the same effects of the accumulator injection as the test, with the depressurization rate increasing as the injection began, then the pressure increasing to temporarily stop the injection as more liquid was boiled in the core, although the magnitude of the pressure changes was smaller than in the test.

Measured and code input core and core bypass powers are shown in Figures 4 and 5, respectively. The bypass heater was turned off when high heater temperatures were achieved, which occurred in the test but not in the calculation. Figure 6 shows the power to the pressurizer heaters. In the test, full power to the heaters was provided for about 5 s. In the calculation, the pressure decreased more rapidly, and full power to the heaters was provided for about 4 s. In both cases, power to the heaters was shut off when the pressure decreased to 13.73 MPa.

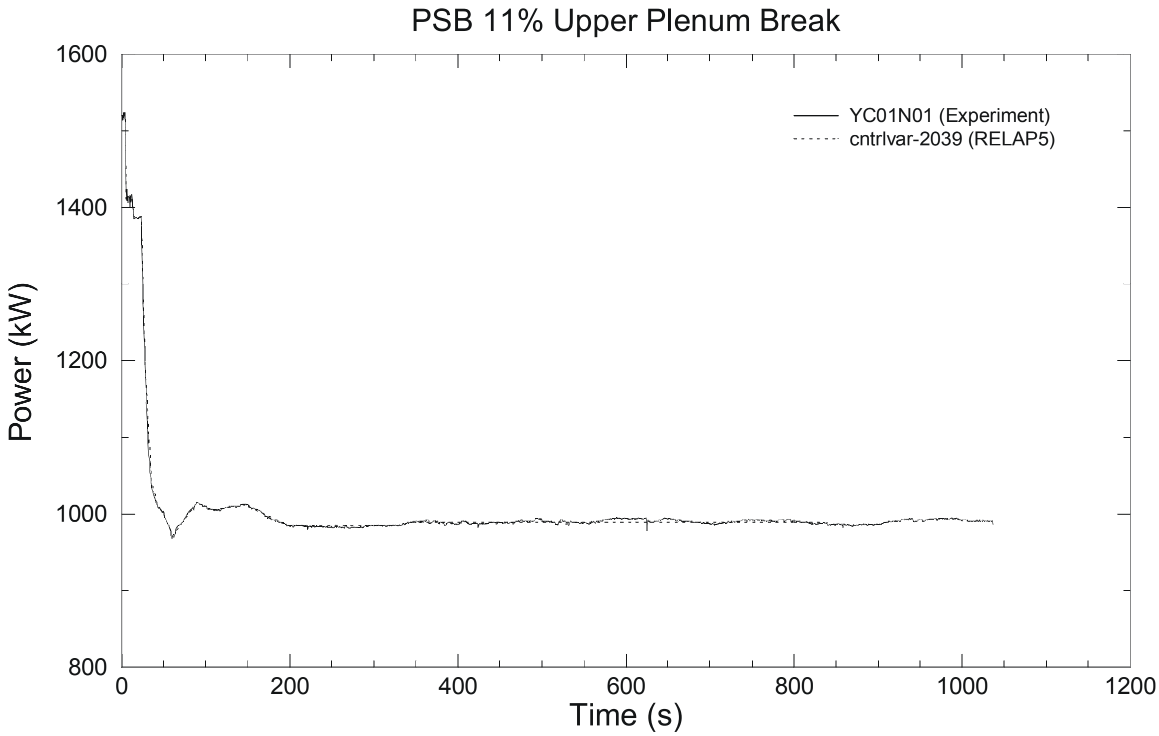

Figure 4. Core power.

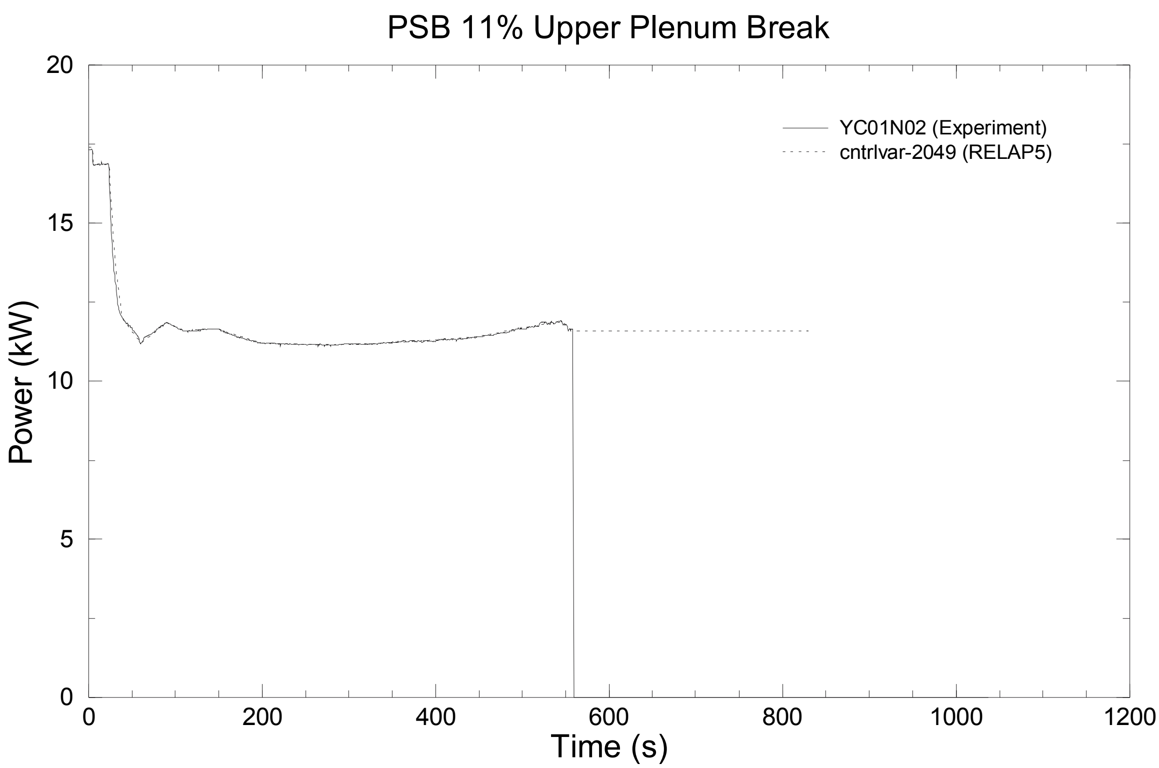

Figure 5. Core bypass power for the base case.

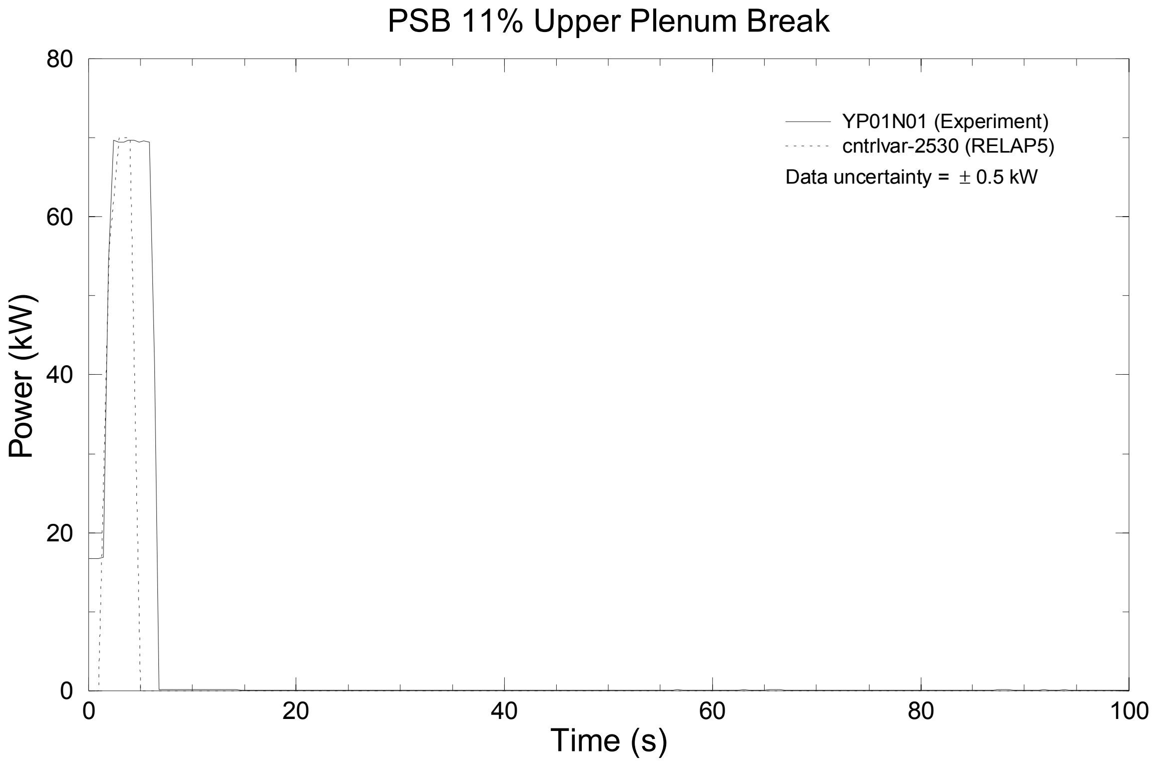

Figure 6. Pressurizer heater power for the base case.

Figure 7 shows the mass flow rate through the break. Despite the higher calculated peak flow rate, the calculation released about the same total mass through the break during the first 20 s. The calculated flow rate was then higher than the measured value for about 50 s, although the upstream fluid densities, shown in Figure 8, were the same; this is an indication that using a smaller discharge coefficient in the input model would provide a better match to the data. The calculated flow made the transition to a high quality mixture faster than the test, resulting in a lower flow rate from 100-300 s. The periodic accumulator injection had a more noticeable effect in the test than in the calculation, causing small increases in the mass flow rate as some of the liquid being injected into the upper plenum was entrained through the break. This is also seen in the fluid density figure. Both the measurement and the calculation show large variations in the fluid density upstream of the break through much of the transient. The measured density increase at the beginning of the transient is questionable. The measured temperature, shown in Figure 9, indicates that in the first 20 s both the temperature and density have increased from their initial values, while the pressure has decreased, which is not self-consistent. The measured temperature was very close to the saturation temperature throughout the test, with a few sharp decreases in temperature indicating colder liquid flowing to the break. This effect was more pronounced in the calculation, where the discrete nodalization allows the colder ECCS flow to be transported to the break piping with less heating than appears to be occurring in the test.

Figure 10 presents the measured and calculated pressurizer levels, for the instrument that spans the portion of the pressurizer from just above the heaters to the top of the tank. This portion of the pressurizer drained slightly faster in the calculation than in the test, emptying at 16 s compared to 19 s. Using a smaller break discharge coefficient, as mentioned above, would improve the draining comparison.

Liquid levels in accumulator 1, which are representative of all the accumulators, are shown in Figure 11. In both the data and the calculation, the periodic injection is reflected in the level response.

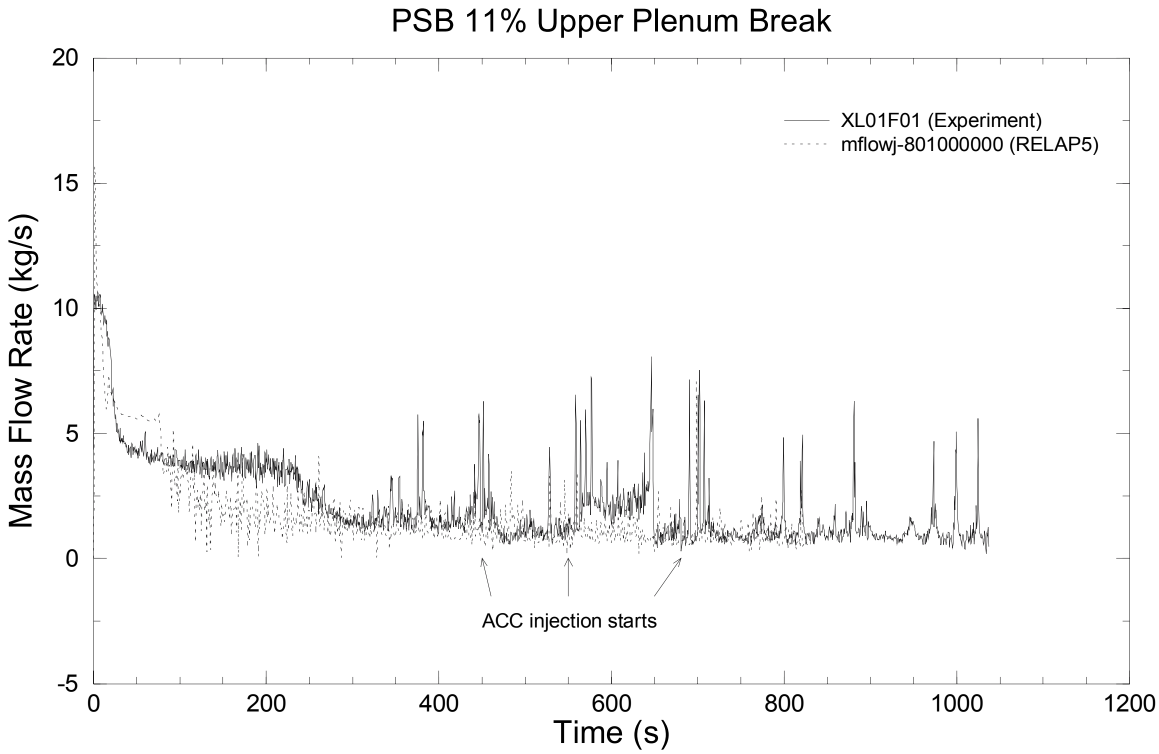

Figure 7. Break flow rate for the base case.

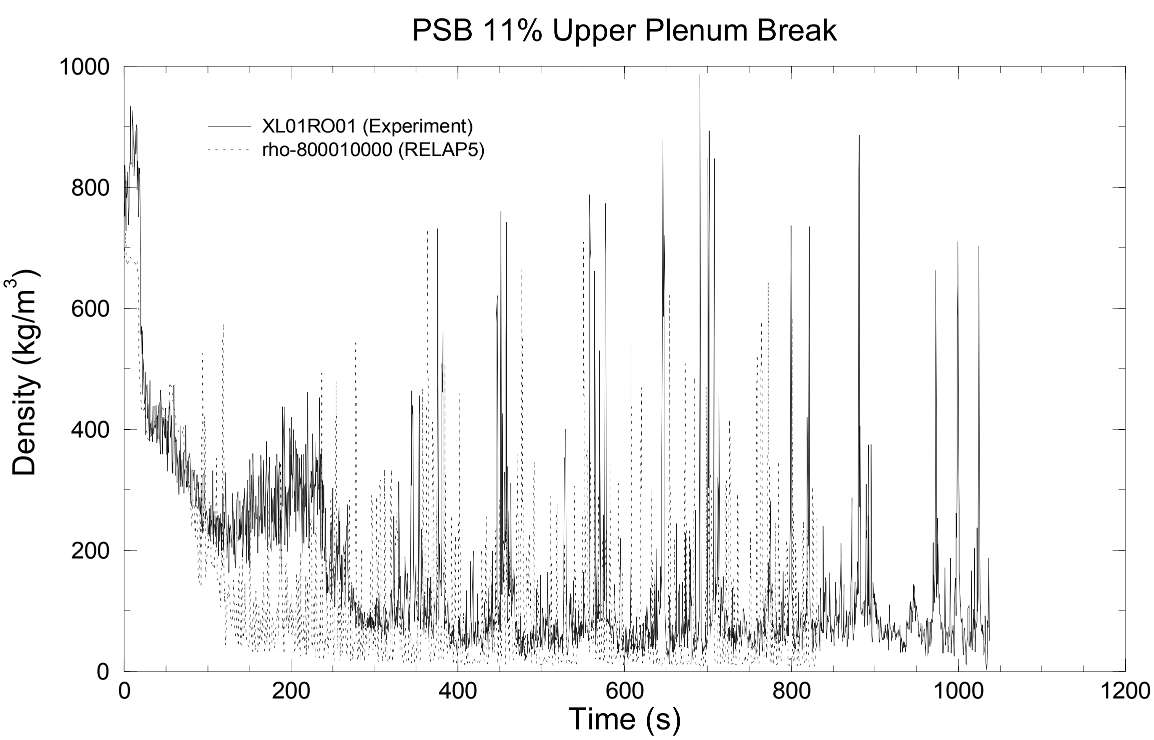

Figure 8. Fluid density in the break piping for the base case.

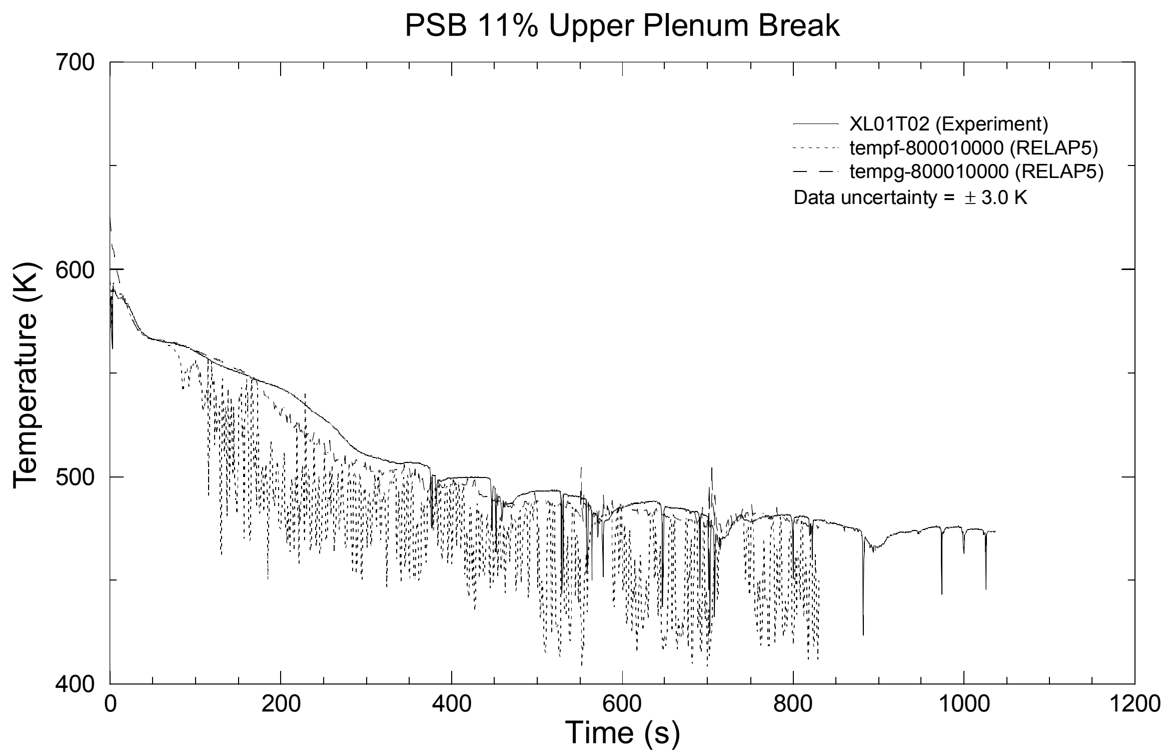

Figure 9. Fluid temperature in the break piping for the base case.

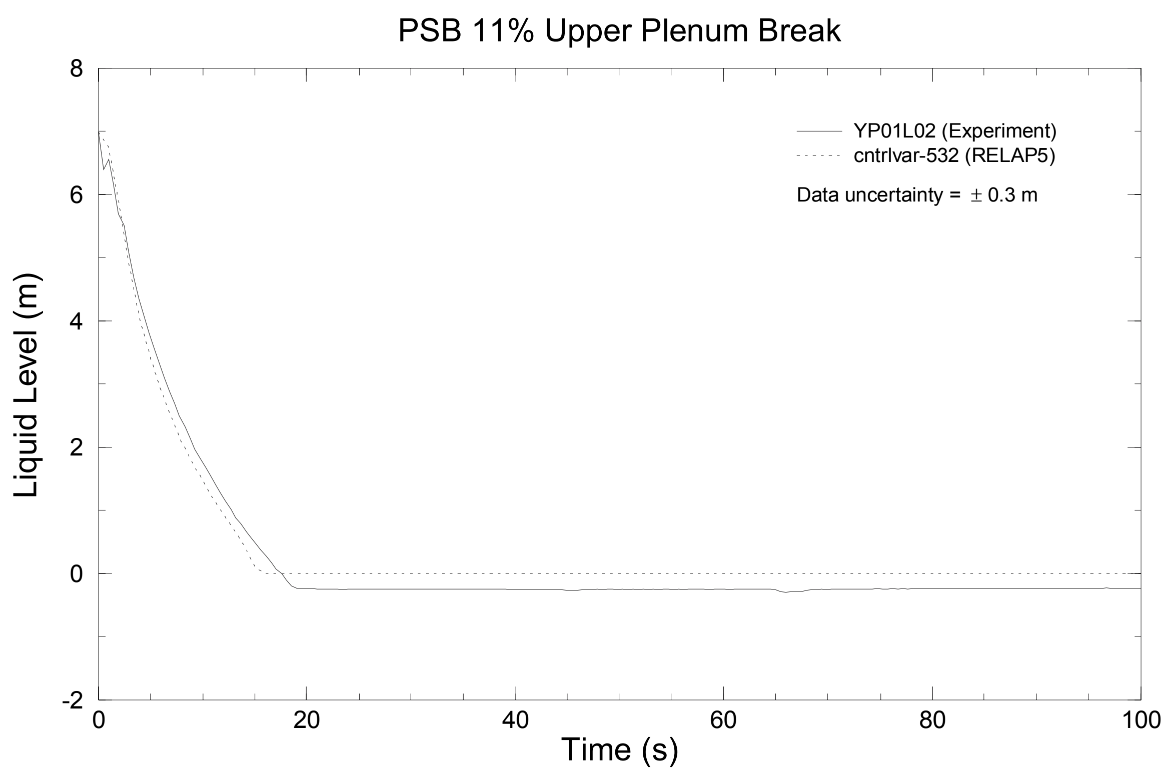

Figure 10. Pressurizer liquid level for the base case.

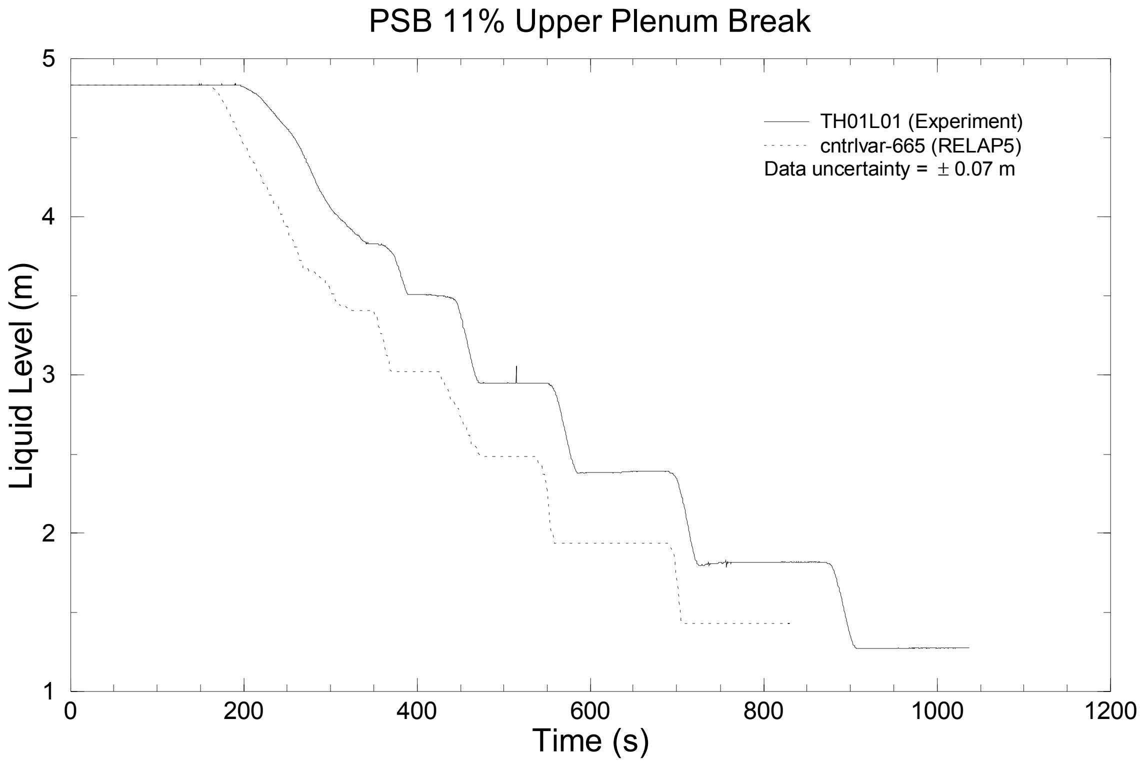

Figure 11. Accumulator 1 liquid level for the base case.

The level decreased more rapidly in the calculation than in the test because the calculated primary system pressure was lower than the measured value.

Accumulator 1 pressures are shown in Figure 12. As with the accumulator levels, the pressure reflects the periodic injection to the primary system, with the calculated pressure dropping earlier because of the lower calculated primary system pressure. The small increases in pressure between injections in the data were not captured in the calculation. The pressure increased because of heat transfer from the hotter walls to the vapor in the accumulator, an effect that was underpredicted by the code.

Mass flow rates through two of the coolant loops are shown in Figures 13 and 14. According to the experiment data report,[6] the measurements are only reliable until 50 s. This time period includes the pump coastdown, starting at 10 s, and the transition to natural circulation flow. The calculations for both loops 1 and 4 are in excellent agreement with the data during this period. Once natural circulation was established in the loops, it did not last long. As steam continued to be generated in the system, it displaced liquid in the steam generators, causing a steady decline in the loop flow rate; by 200 s, there was essentially no flow through the coolant loops in the calculation.

With no forced flow through the system, the differential pressure measurements provide an indication of the collapsed liquid level, or average void fraction, between the pressure taps. The indicated differential pressure will move toward zero (the absolute value decreases) as the liquid between the pressure taps is replaced by steam (as the void fraction increases or the collapsed level decreases). These instruments can be used to determine how the liquid is distributed in the facility.

Differential pressures in different axial regions of the core are shown in Figures 15-17. The initial void formation in the core was reasonably simulated by the code. In the experiment, the upper portion of

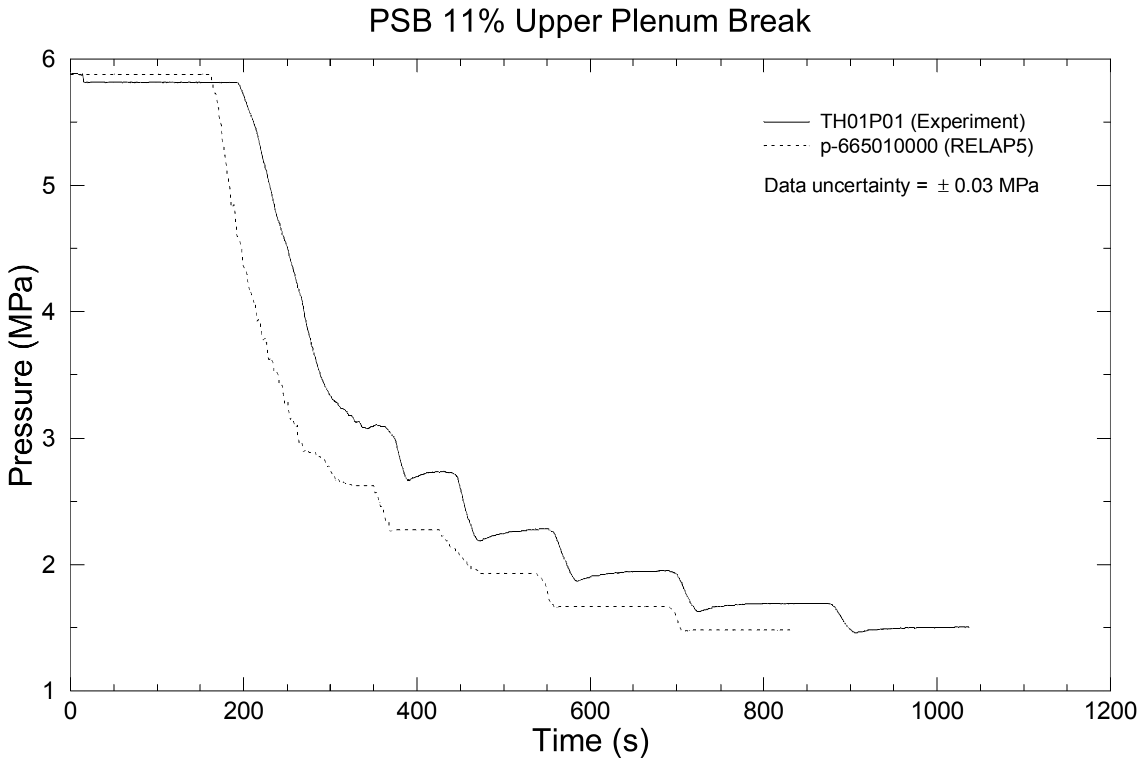

Figure 12. Accumulator 1 pressure for the base case.

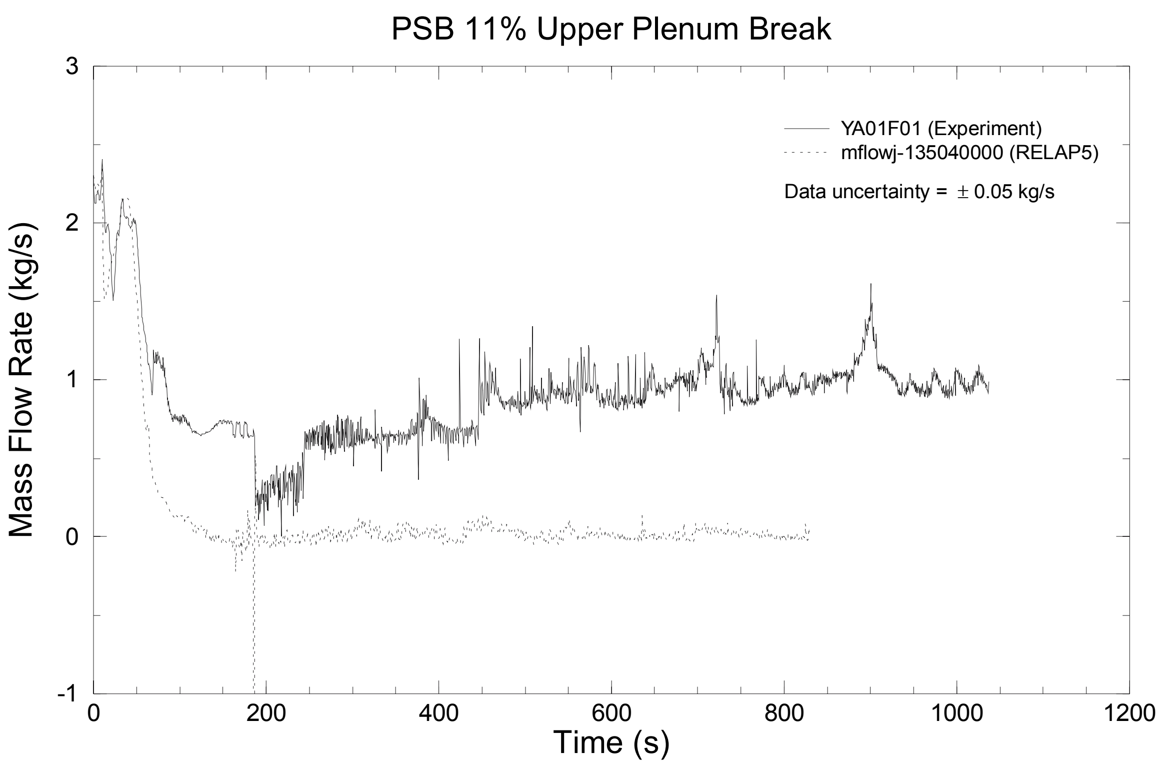

Figure 13. Loop 1 mass flow rate for the base case.

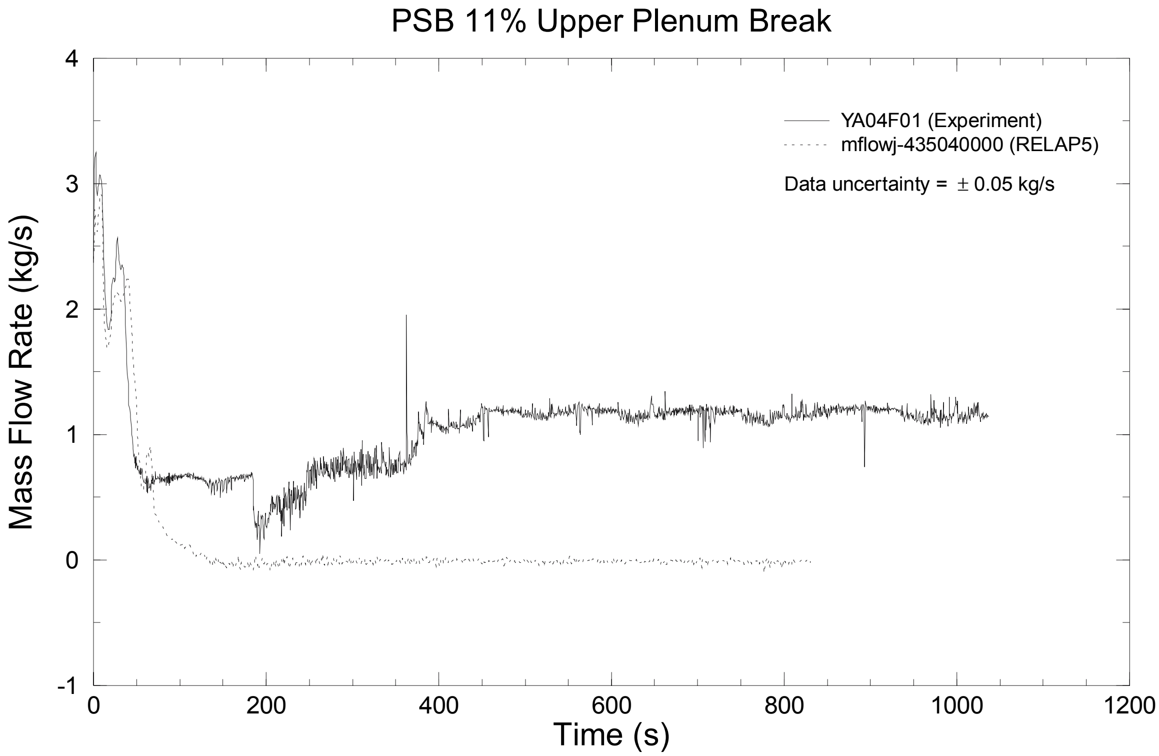

Figure 14. Loop 4 mass flow rate for the base case.

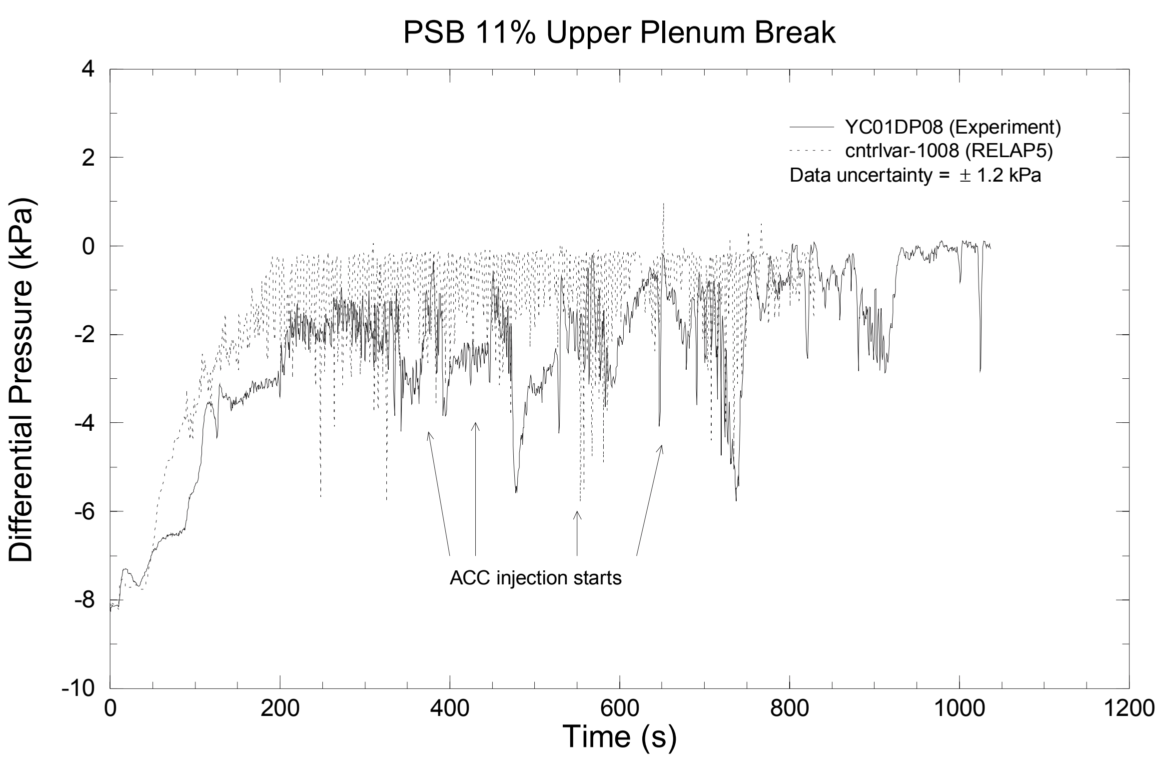

Figure 15. Differential pressure in the lower portion of the core simulator for the base case.

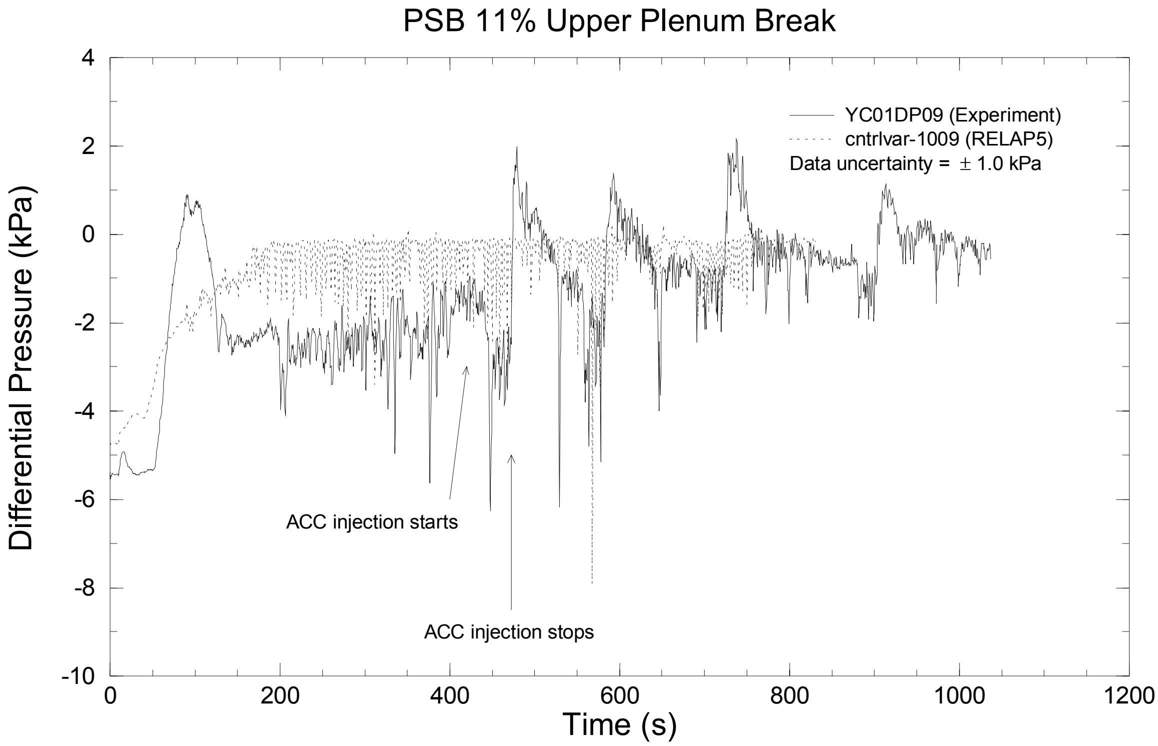

Figure 16. Differential pressure in the middle portion of the core simulator for the base case.

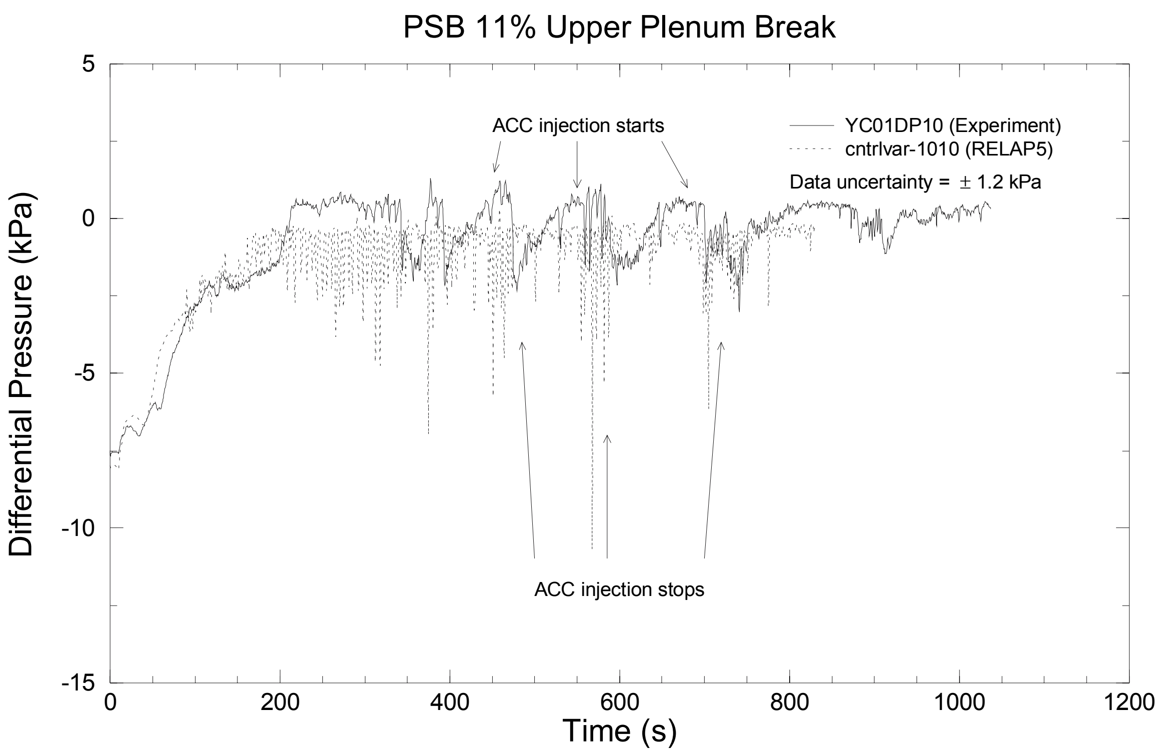

Figure 17. Differential pressure in the upper portion of the core simulator for the base case.

the core had less liquid than the lower portions, while in the calculation the axial void profile was fairly uniform. The effects of the accumulator injection were also different in the test and calculation. In the test, the beginning of the accumulator injection cycle resulted in decreases in the differential pressure after a short delay. After the injection stopped, the differential pressures in the upper and lower portions slowly moved toward their previous values, and the middle of the core saw a rapid increase to values above zero. Since the measurement should read slightly below zero when the region is steam filled, this may be an indication of a problem with the measurement. In the calculation, there was no noticeable effect of the accumulator injection on the differential pressures. This is further illustrated by the core collapsed level response, shown in Figure 18, where there is very little change in the core liquid content during most of the transient.

The differential pressure across the core bypass is shown in Figure 19. The calculation agrees well with the data before accumulator injection begins, then generally has less liquid than in the test. When accumulator injection starts before 200 s, the initial effect is a reduction in the liquid level in the core bypass. The reduced system pressure resulting from condensation on the injection liquid allows some of the remaining liquid to flash or boil. Subsequent injections of liquid from the accumulators resulted in level increases in both the data and calculation, which are reflected as decreases in the differential pressure. The impact of the injection is more pronounced in the test than in the calculation. Despite retaining less liquid, the core bypass wall temperatures were lower in the calculation than were measured. With lower temperatures, the bypass heater power remained on throughout the calculation, whereas in the test the power was reduced to protect the heaters when the peak temperature reached 673 K near 560 s.

Differential pressures in the upper plenum are shown in Figures 20 and 21. More liquid was retained in the calculation than in the experiment, particularly in the upper portion of the upper plenum. Possible reasons for the overprediction of the liquid inventory in the upper plenum are that CCFL at the core exit is preventing liquid from falling back into the core region in the calculation, that the interphase drag is overpredicted at the core exit, again preventing liquid from separating from the vapor flow and draining to lower portions of the reactor vessel, or that interphase drag is underpredicted at the connection to the break piping, not allowing enough liquid to be entrained from the upper plenum into the break piping.

Differential pressures in the upper head are shown in Figures 22 and 23. The early draining of the upper head region was well calculated by the code.

Differential pressures in the downcomer are shown in Figures 24 and 25. In the test, the upper portion of the downcomer drained completely before 200 s. Water injection from the accumulators temporarily restored liquid to this region, but it drained completely between injection cycles. The calculated level did not drop that far, retaining some liquid between injection cycles. Accordingly, the calculated differential pressure in the lower portion of the downcomer did not show as much of an effect of the accumulator injections, especially later in the transient. A major feature not captured in the calculation is the apparent complete draining of the downcomer near 200 s. This was the only time during the test that the level dropped nearly that far, and it is not clear what caused this response, as there is no corresponding change in other differential pressure measurements that indicate that liquid has flowed from the downcomer to some other location in the system; in fact, the core and core bypass differential pressures also show a reduction in liquid inventory at this time.

Figure 26 shows the differential pressure in the steam generator 1 hot collector, which is typical of the behavior seen in all four loops. The hot collector drains within about 70 s in the test, and a little earlier in the calculation, not long after boiling began in the core. The steam generator tubes then drained into the cold collector; in the calculation, all of the tubes were dry by about 180 s.

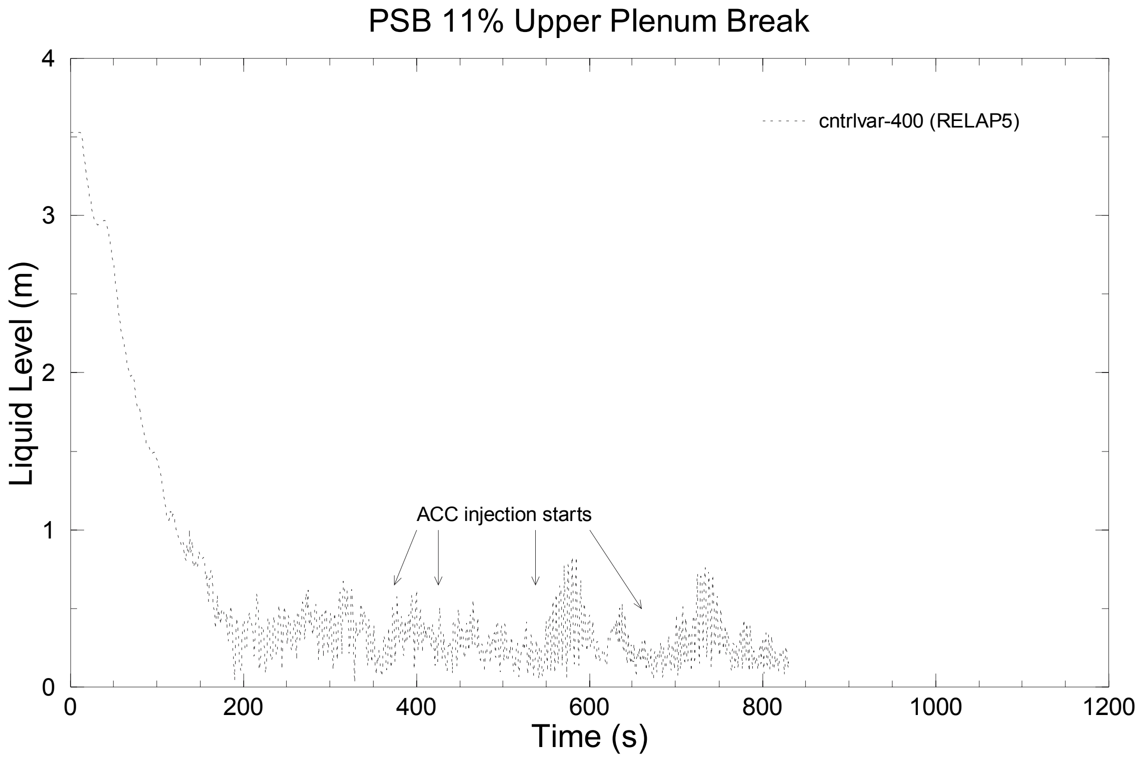

Figure 18. Core collapsed liquid level for the base case.

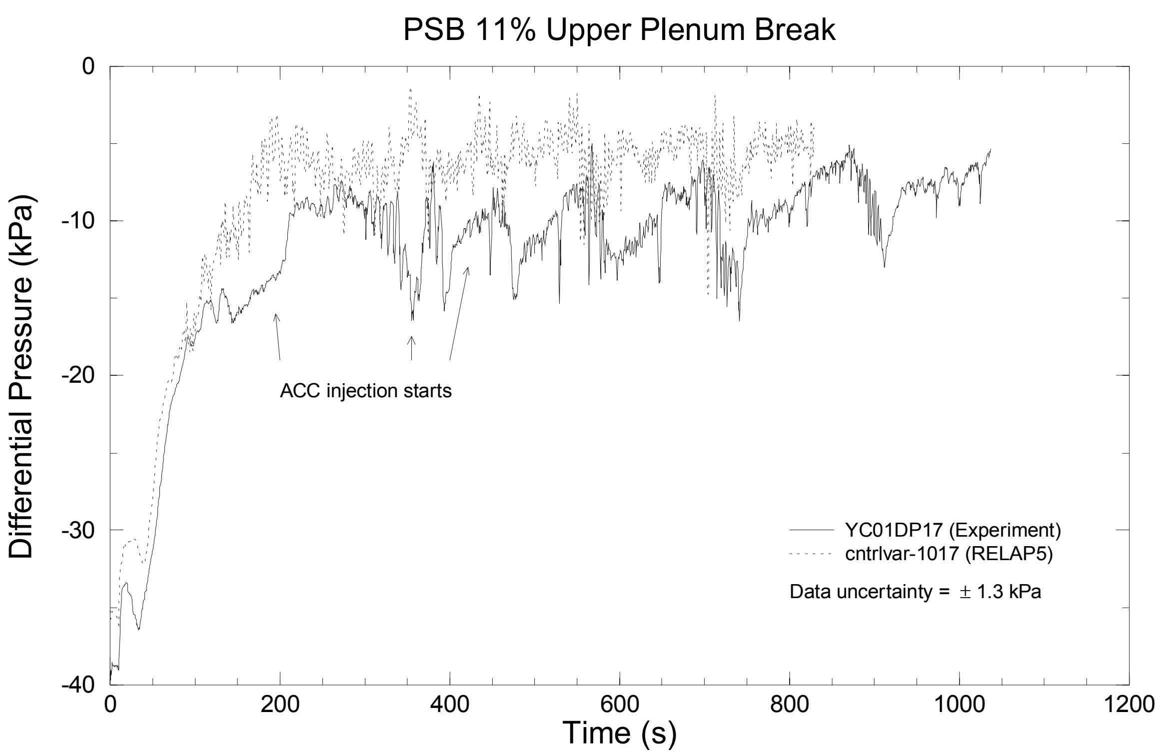

Figure 19. Core bypass differential pressure for the base case.

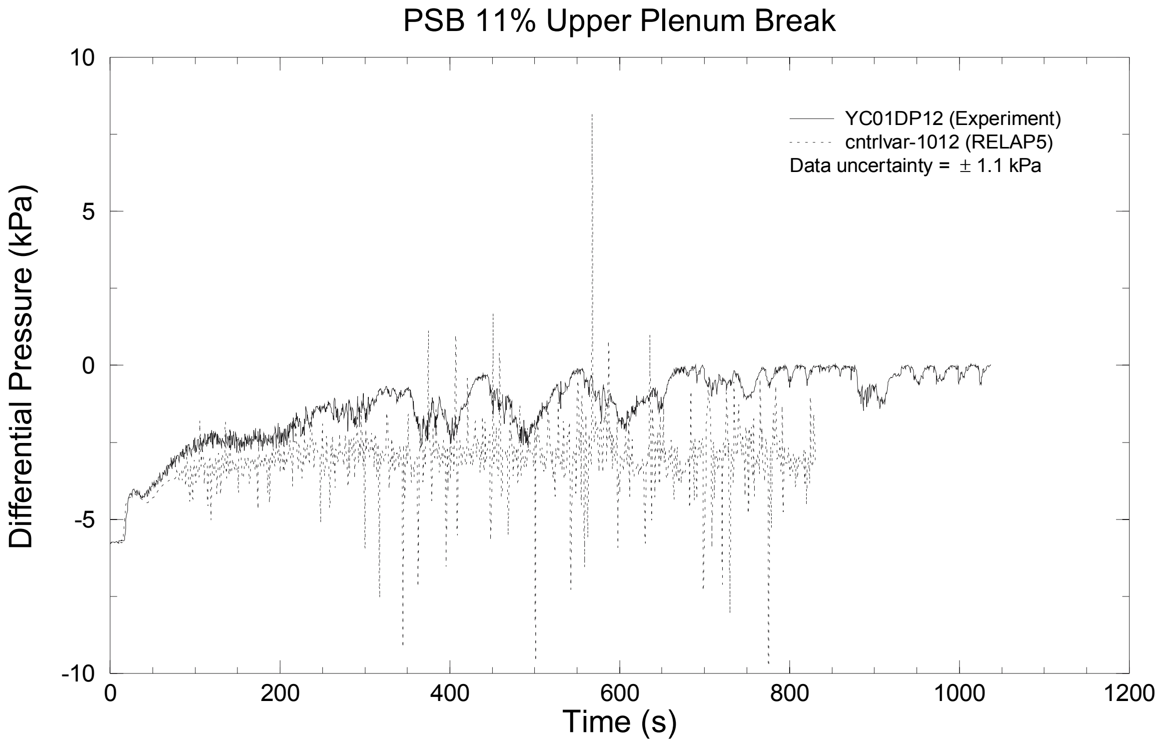

Figure 20. Differential pressure in the lower portion of the upper plenum for the base case.

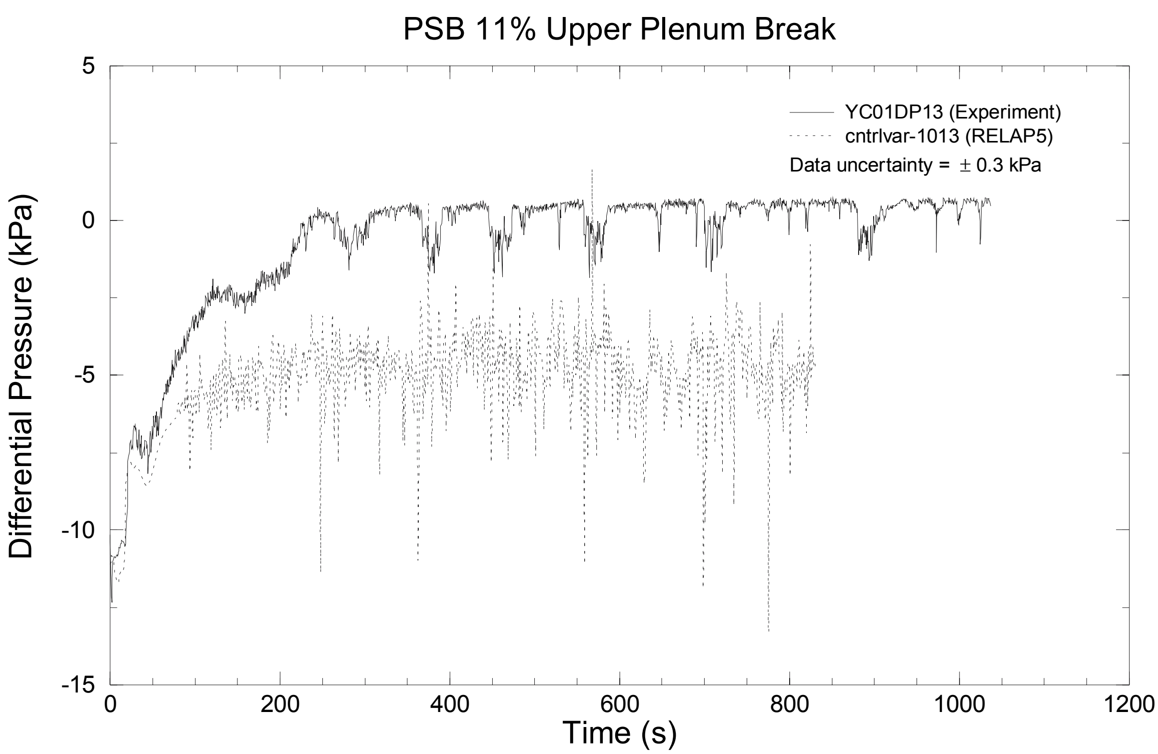

Figure 21. Differential pressure in the upper portion of the upper plenum for the base case.

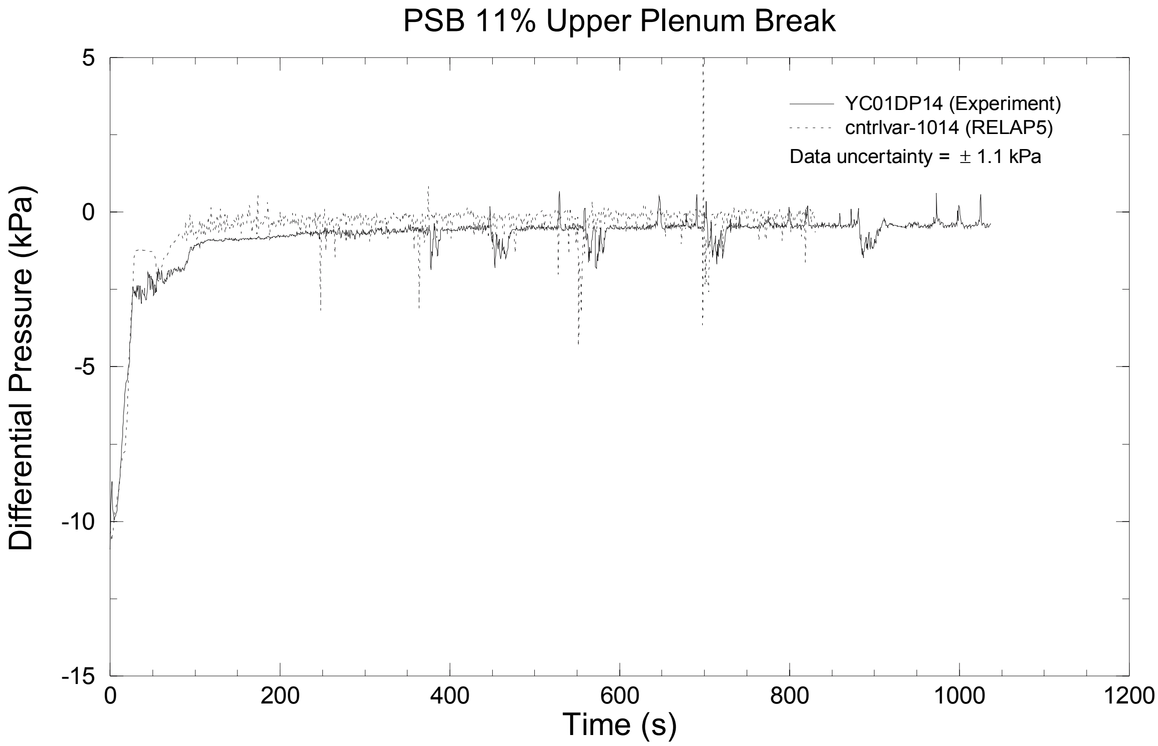

Figure 22. Differential pressure in the lower portion of the upper head for the base case.

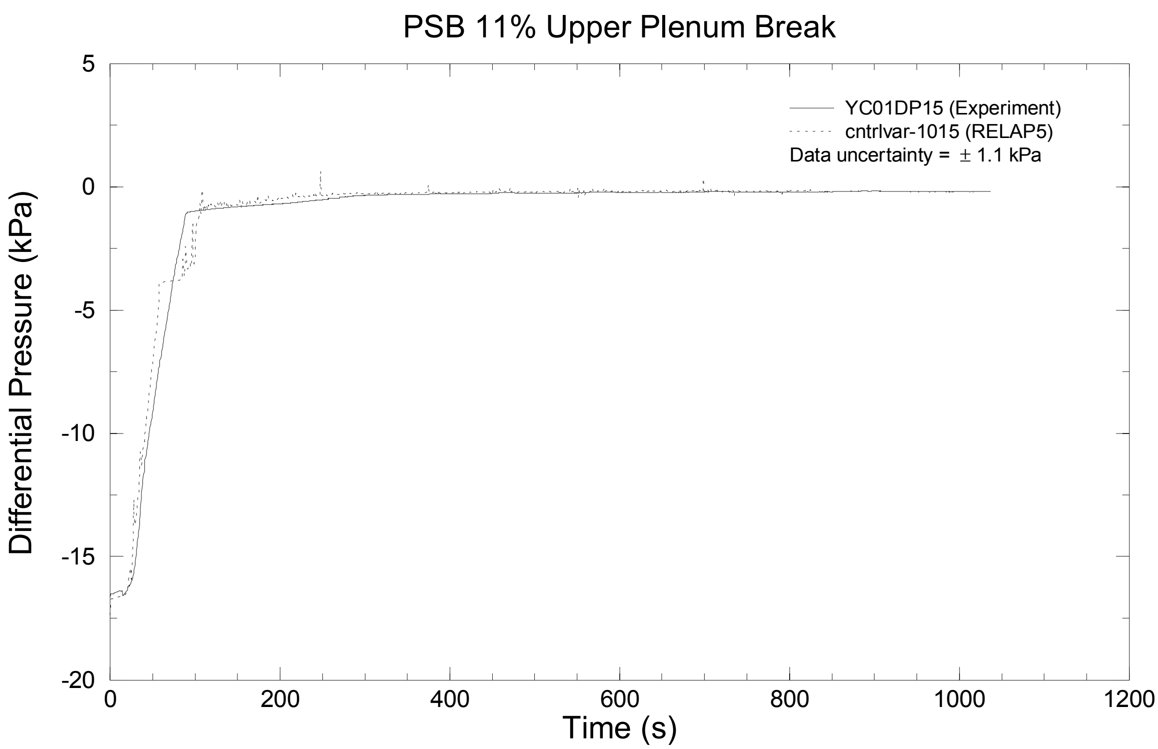

Figure 23. Differential pressure in the upper portion of the upper head for the base case.

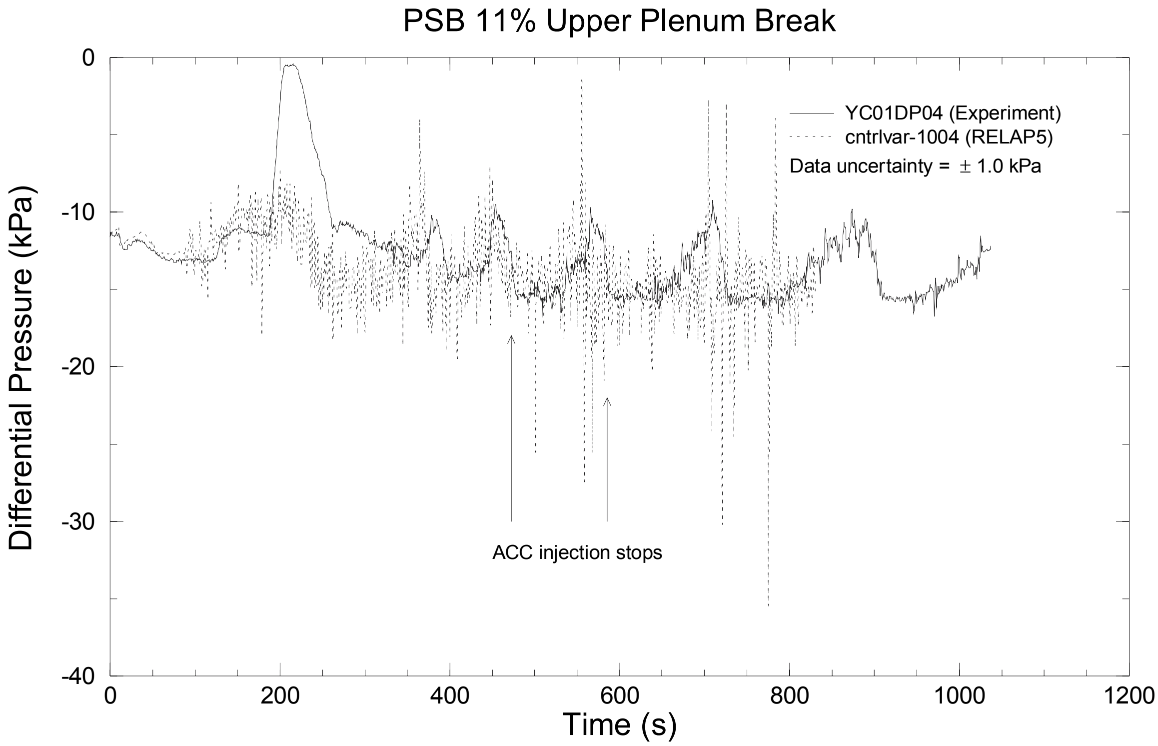

Figure 24. Differential pressure in the lower portion of the downcomer for the base case.

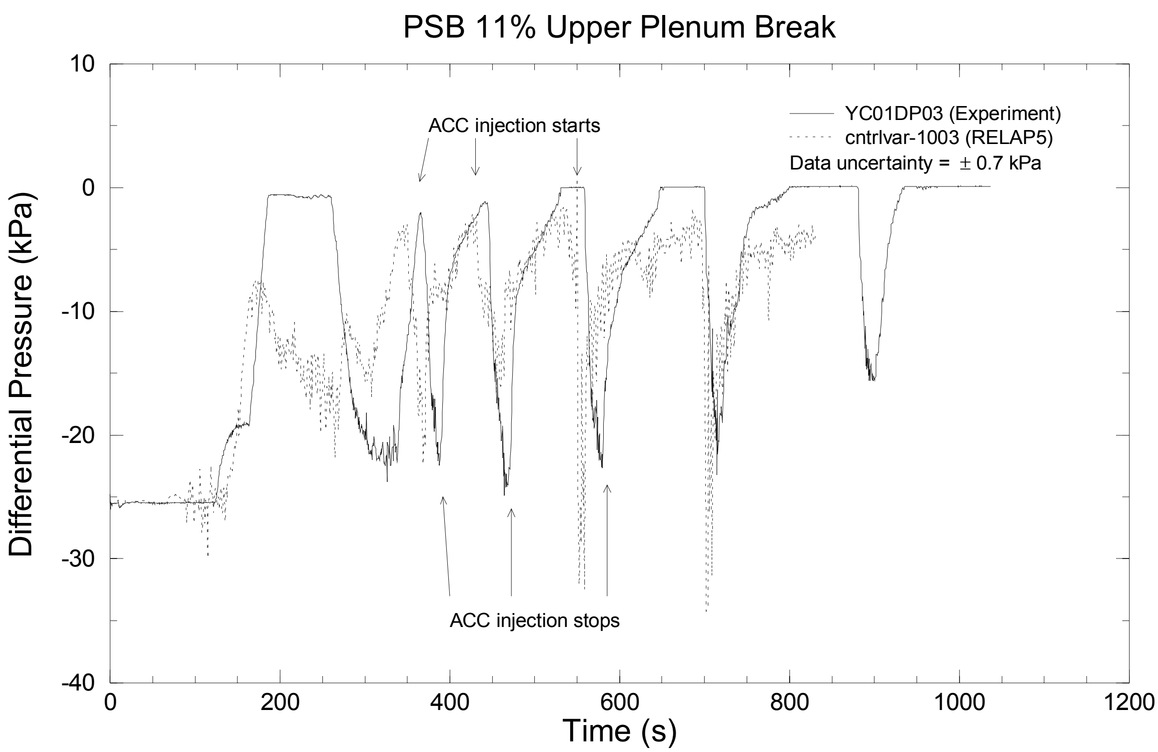

Figure 25. Differential pressure in the upper portion of the downcomer for the base case.

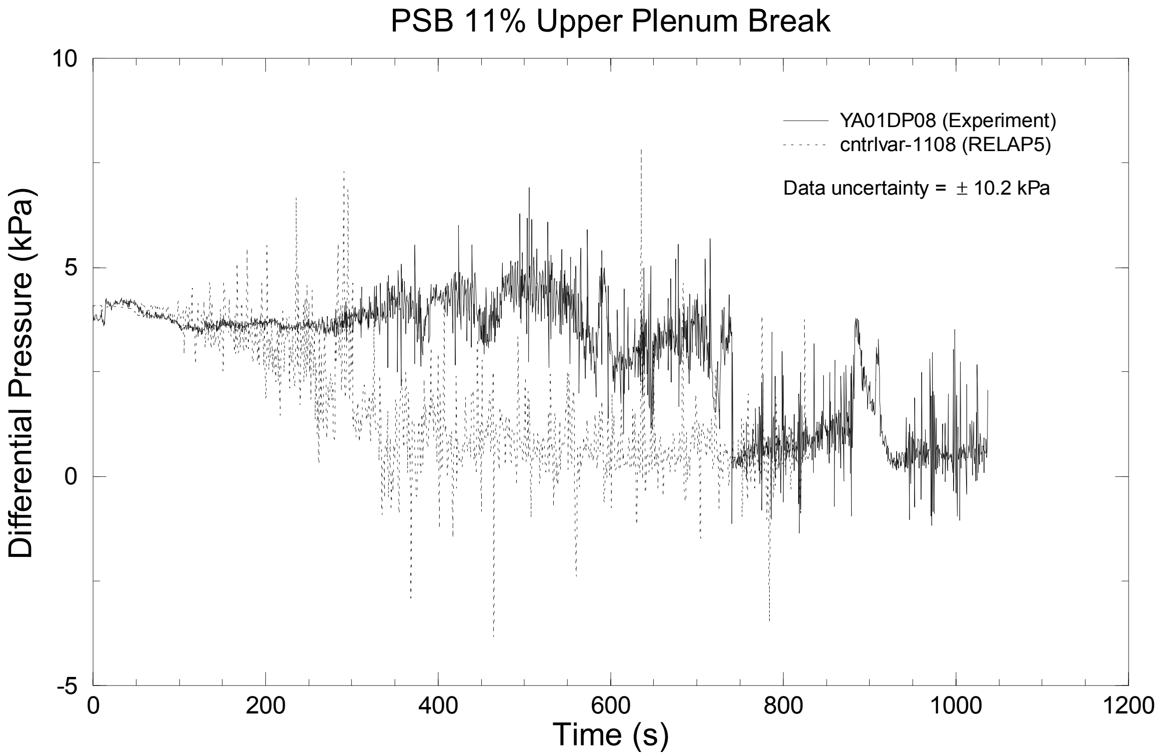

Figure 26. Differential pressure in the steam generator 1 hot collector for the base case.

The behavior of the loop seals is illustrated by the differential pressures in Figures 27-29. When the accumulators were injecting liquid, condensation in the vessel drew liquid from the steam generator side of the loop seals into the pump side; since the pump side was full during the first half of the transient, the evidence is in the pump differential pressure measurement. When the injection stopped, the liquid levels on the two sides of the loop seal equilibrated, moving liquid from the pump side to the steam generator side. However, some of the liquid flowed through the cold leg to the downcomer during the injection phase, so that the amount of liquid in the loop seals decreased with each injection cycle, leading to loop seal clearing near 750 s. In the calculation, the loop seals had cleared by about 400 s. As in the test, the pump differential pressure calculation (Figure 29) showed that liquid was being drawn from the loop seal into the pump when the accumulators were injecting.

Measured and calculated fuel simulator cladding surface temperatures are shown in Figures 30 and 31, respectively. The data show a series of top-down core heatups that were terminated by accumulator injection, returning the cladding to the coolant saturation temperature. As the transient progressed, the accumulator injection became less effective in terminating the heatup, as more of the length of the heater rods became involved in the heatup. By the end of the transient, the accumulator injection could only partially cool (not quench) the core, and the heatup continued until the power was reduced to protect the heater rods. In the calculation, the heatup started about 50 s earlier than in the test, because of the lower system pressure, and there were almost continuous small heatups of 20-30 K over the entire length of the core. While a greater portion of the core was involved than in the test, the heatups were not as extensive. Near 350 s, a more extensive heatup was calculated in the top portion of the core, which was subsequently quenched by accumulator injection. The next two periods of extended core heatup were only partially quenched by the accumulator injection, and the temperatures increased sufficiently that the calculation was terminated at 830 s.

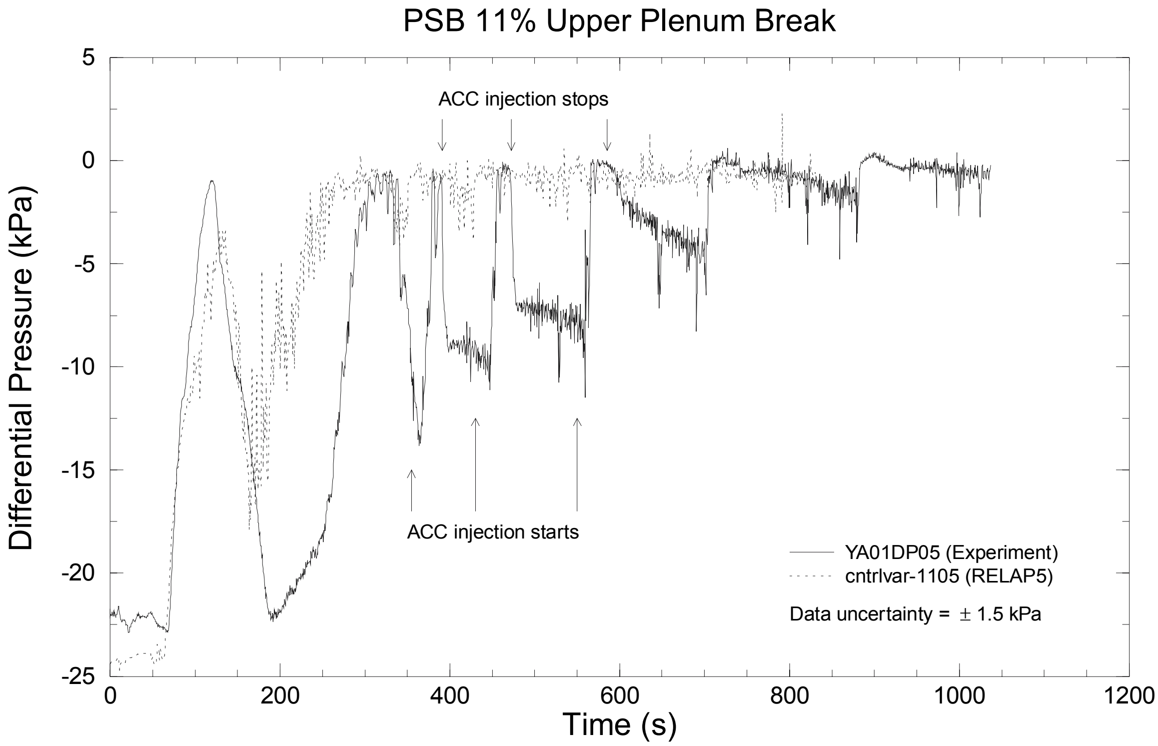

Figure 27. Differential pressure in the SG side of the loop 1 loop seal for the base case.

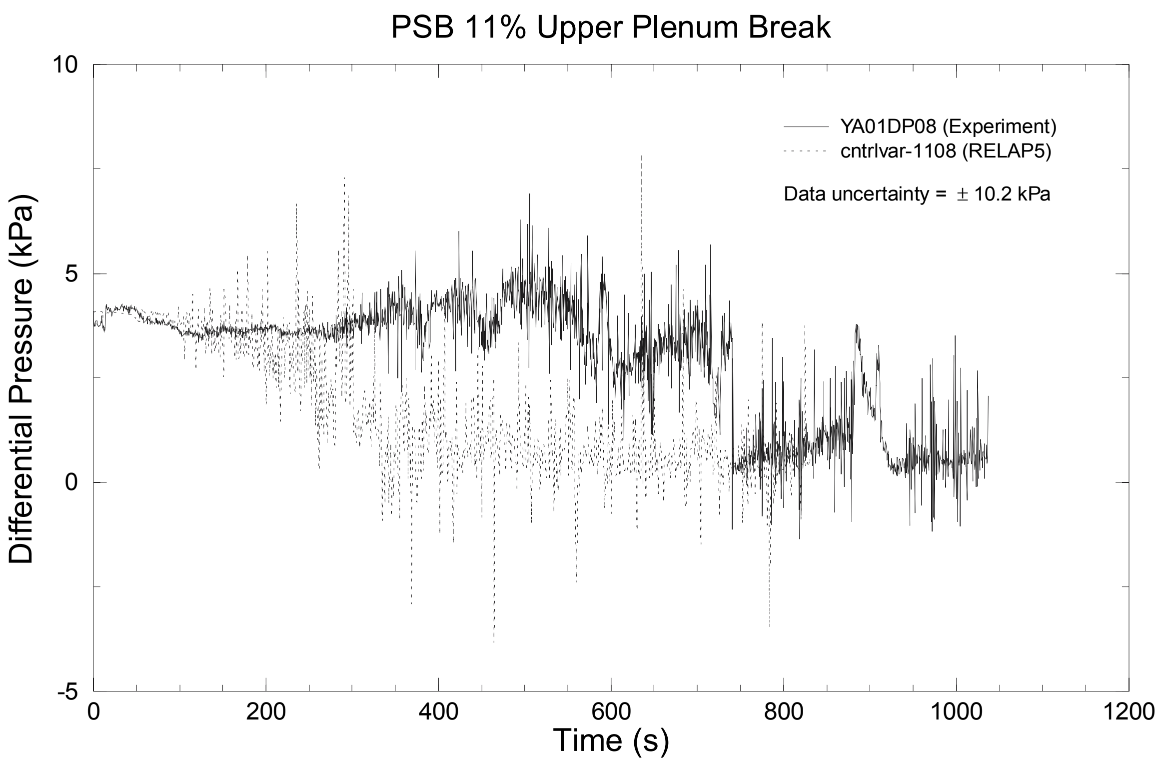

Figure 28. Differential pressure in the pump side of the loop 1 loop seal for the base case.

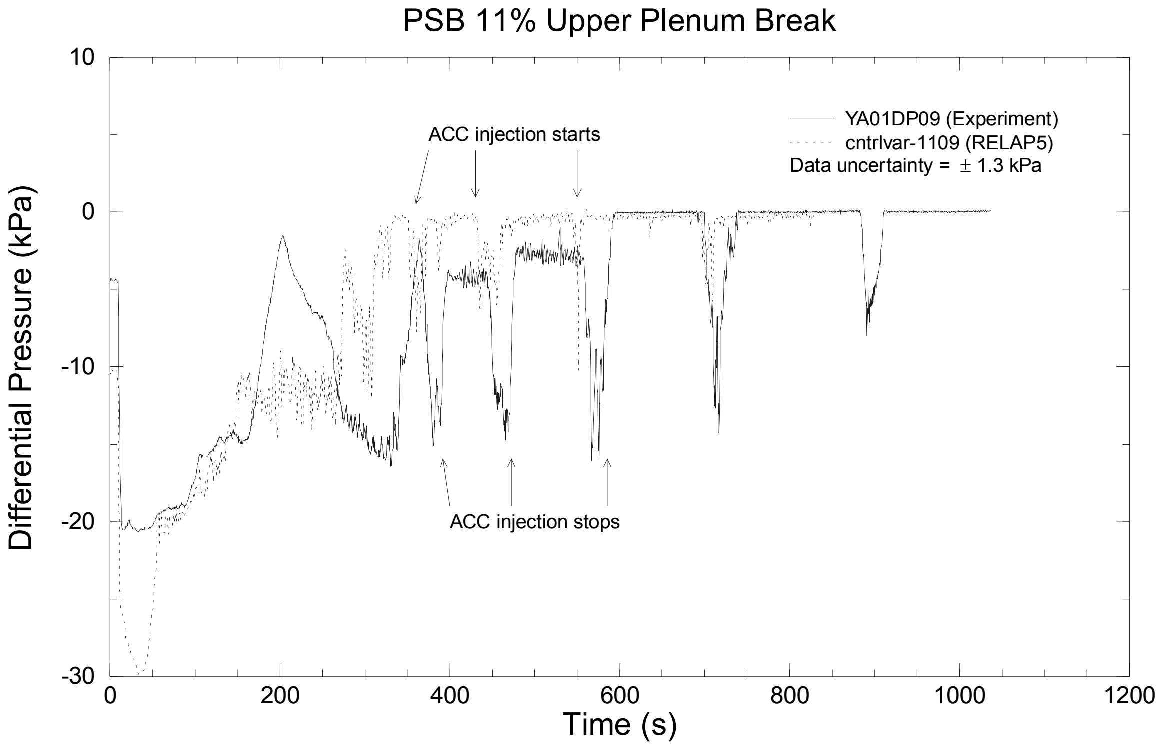

Figure 29. Differential pressure across the loop 1 pump for the base case.

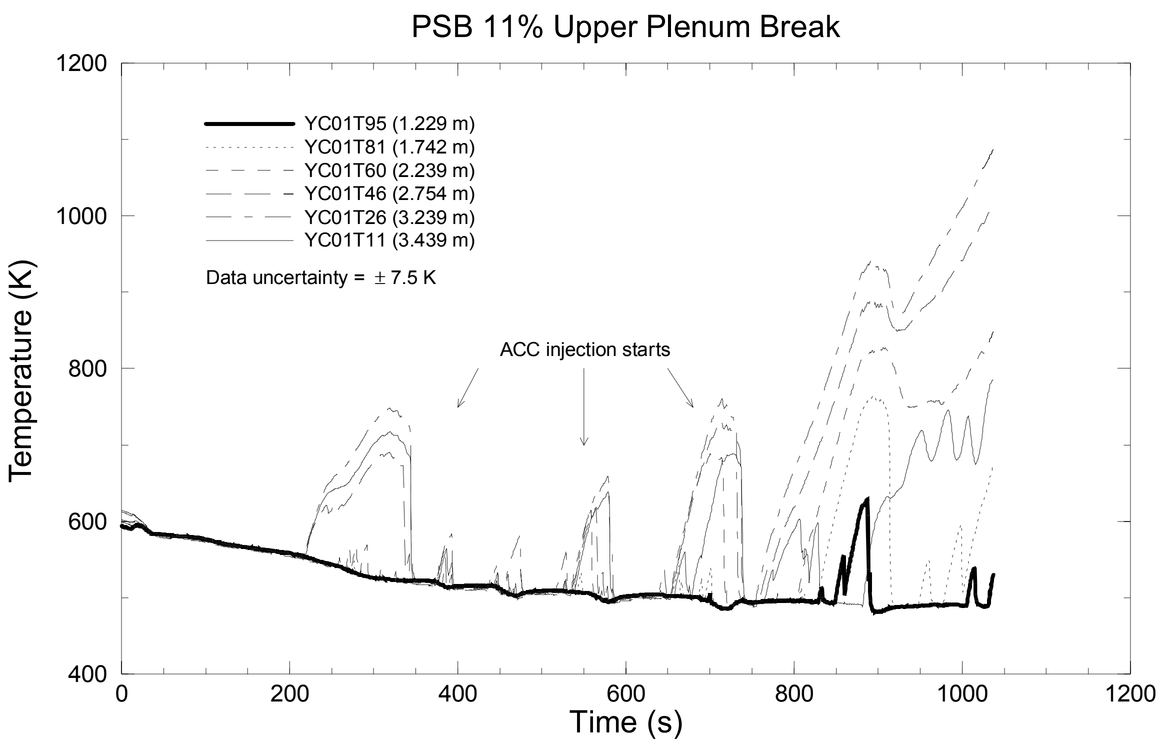

Figure 30. Measured heater rod surface temperatures.

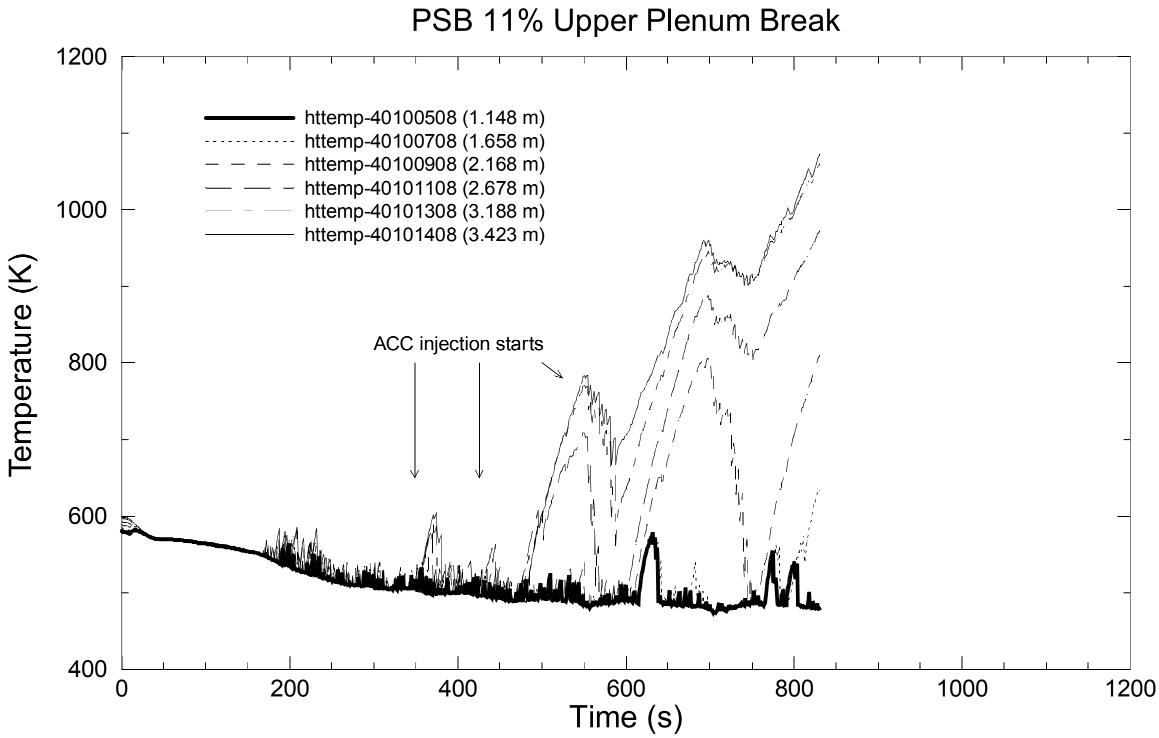

Figure 31. Calculated heater rod surface temperatures for the base case.

The response of the top-most measured temperature near the end of the test suggests that there may have been some liquid entering the core from the upper plenum to partially cool the upper end of the heater rods. This was not predicted in the calculation, where the CCFL model was invoked at the core outlet junction more than 70% of the time after the core heatup began, often preventing liquid in the upper plenum from flowing down into the core. Measured temperatures near the top of the core from several different heater rods are shown in Figure 32, where it is seen that there is some radial variation in the temperatures. There are likely some multi-dimensional effects in the experiment that allow some liquid penetration from the upper plenum into the core, but these cannot be captured with the one-dimensional nodalization used in the RELAP5 model.

Fluid temperatures in the top of the upper head are presented in Figure 33. In both the test and the calculation, this region is stagnant, and the vapor temperature remains superheated because of heat transfer from the hot vessel wall.

Coolant temperatures in the loop 4 hot leg are shown in Figure 34. The effect of the HPI flow is evident in both the data and the calculation. The highly subcooled liquid being injected flows toward the reactor vessel, sharply reducing the temperature being measured when it contacts the thermocouple. This effect is seen much earlier in the calculation than in the data.

Coolant temperatures in the loop 1 hot leg are presented in Figure 35. After natural circulation flow ends, the measured temperature begins to show superheating. This could be the result of actual superheating of the vapor, or the thermocouple could be reading a wall temperature rather than the fluid temperature. In either case, the superheated temperature is an indication that there is little to no flow through the loop. The temperature returns to the saturation temperature as the accumulators empty. The condensation caused by the accumulator injection moves fluid through the pipes, causing the temperature

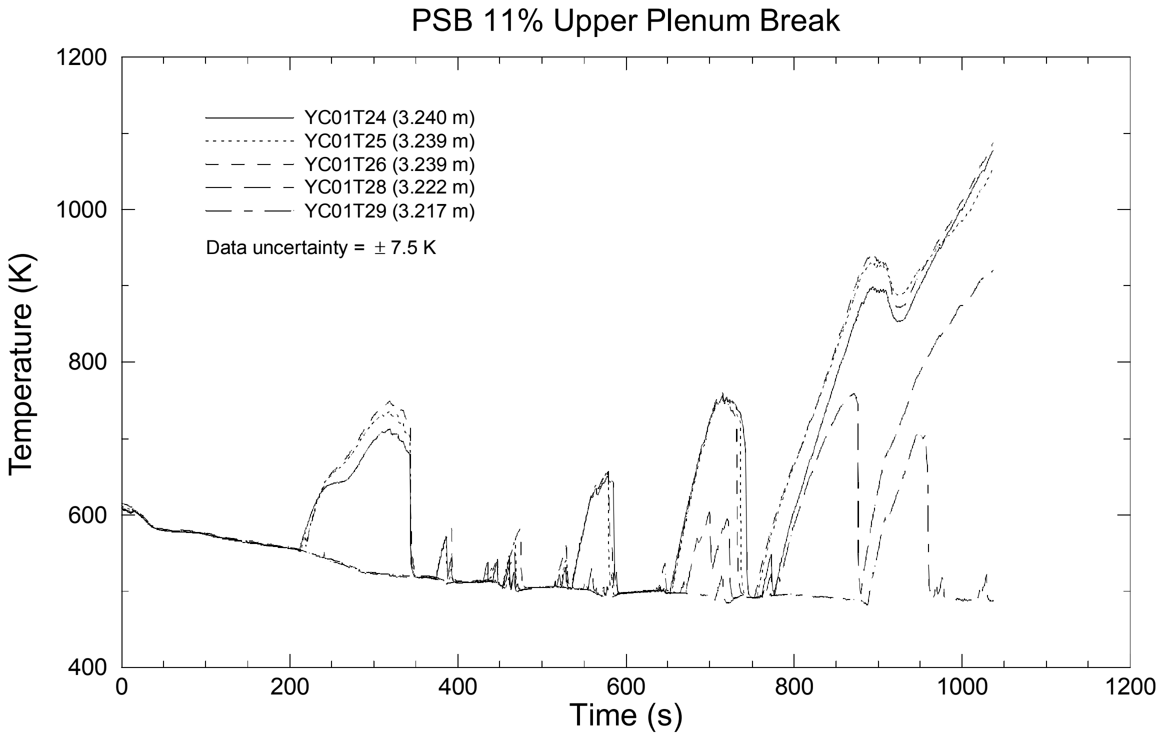

Figure 32. Measured heater rod surface temperatures near the top of the core.

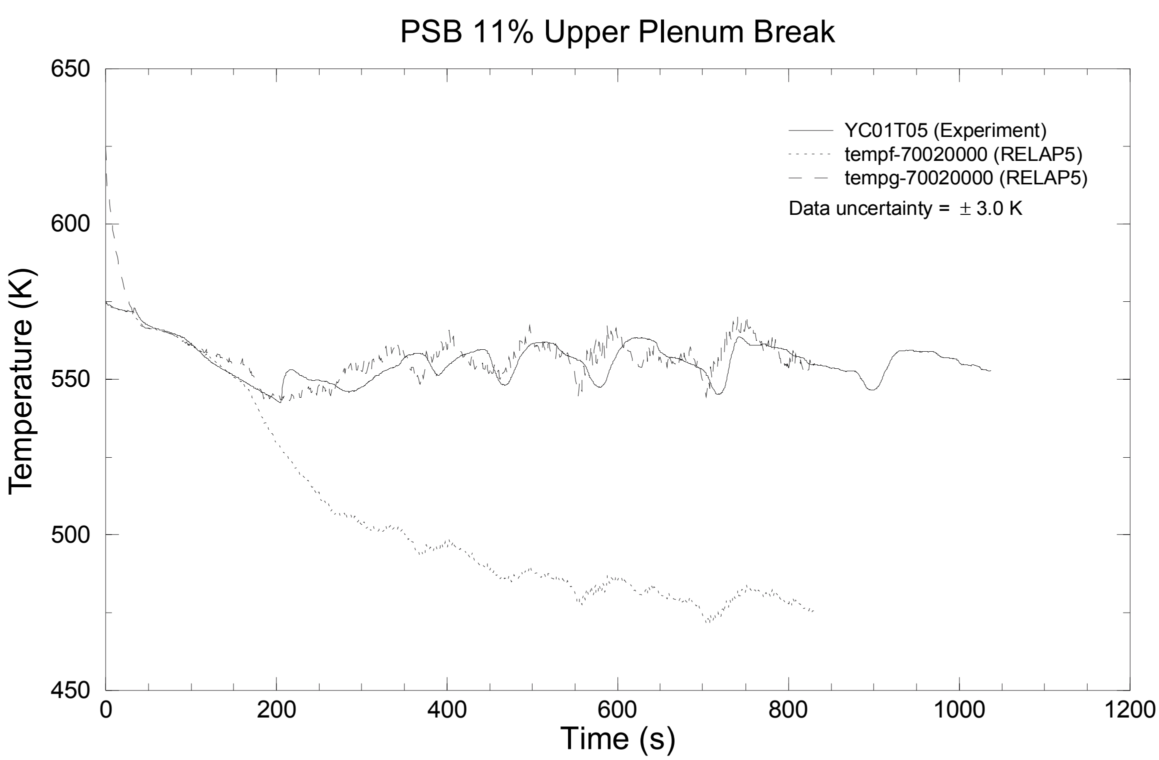

Figure 33. Fluid temperature at the top of the upper head for the base case.

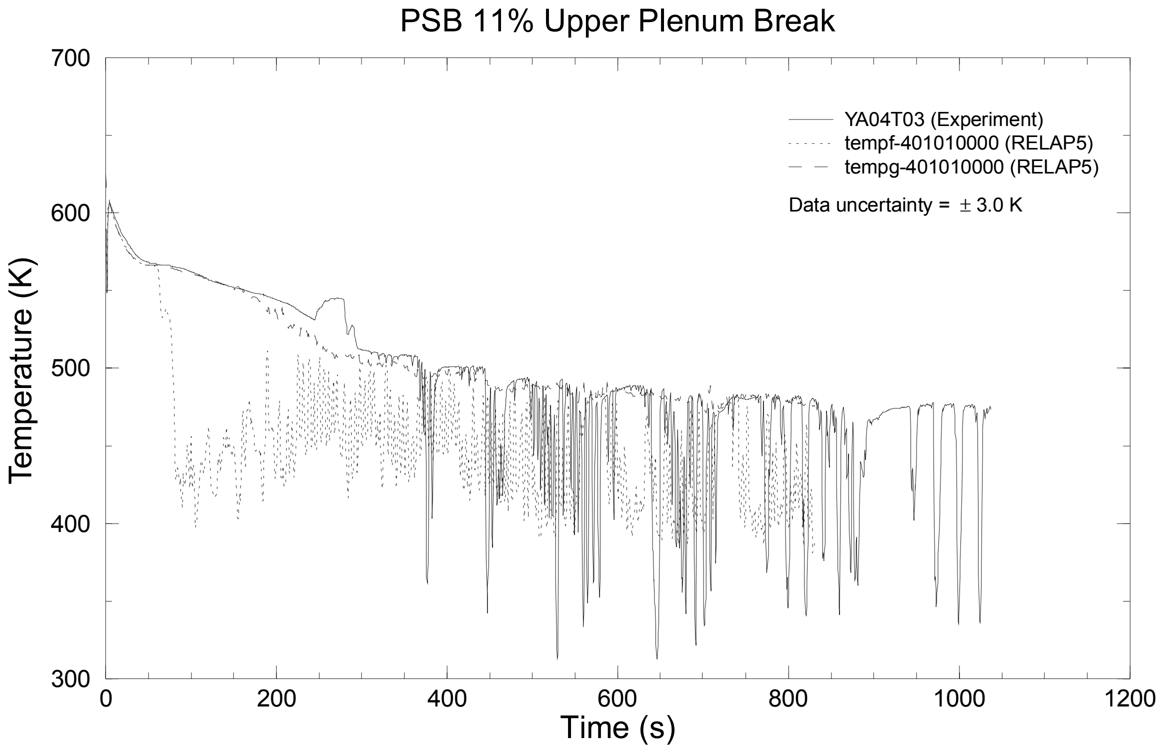

Figure 34. Loop 4 hot leg fluid temperature for the base case.

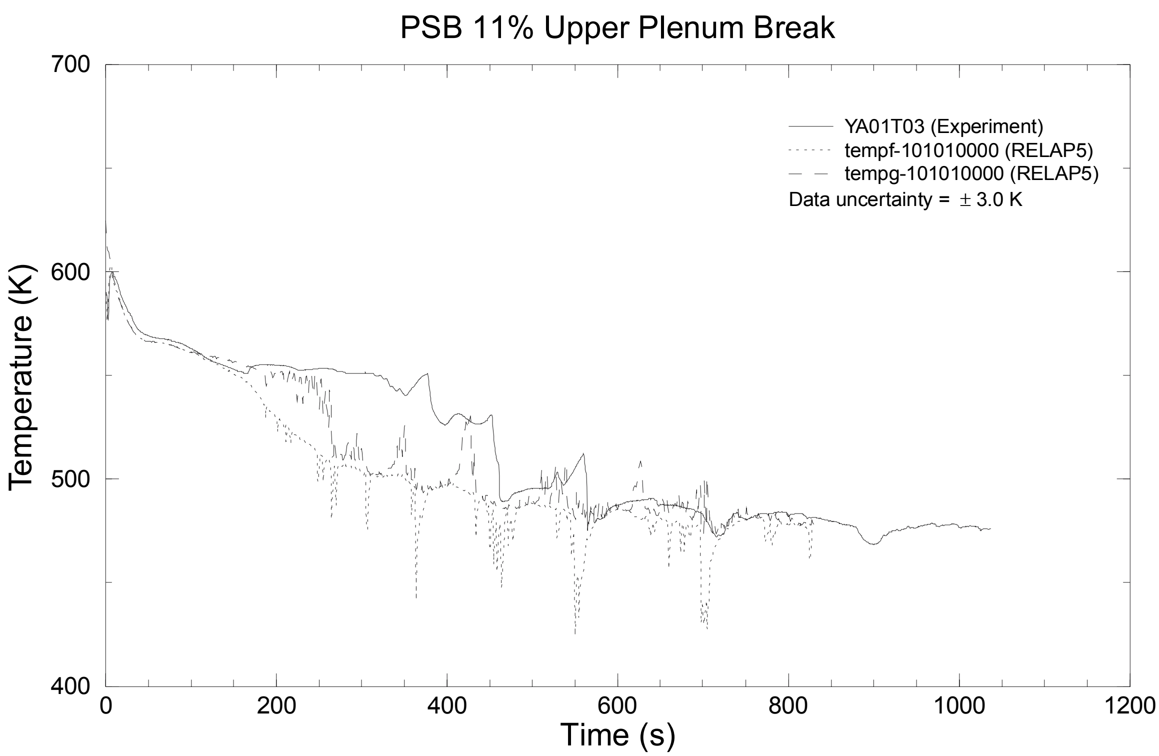

Figure 35. Loop 1 hot leg fluid temperature for the base case.

to drop. In the calculation, less superheat is observed, and there is some colder liquid appearing in the hot leg from either the HPI in the loop 4 hot leg or the accumulator injection to the upper plenum.

Coolant temperatures in the loop 4 cold leg are presented in Figure 36. In the RELAP5 calculation, the coolant became slightly superheated after the cold leg drained; the liquid phase was at the saturation temperature from about 150 s until the end of the transient. The periodic decreases in coolant temperature after 300 s in both the data and the calculation were caused by accumulator injection. The injection of cold water caused some of the steam in the system to condense, reducing the pressure and saturation temperature.

The pressure in steam generator 1 is presented in Figure 37. The measured pressure increased rapidly to a peak value of about 8.1 MPa when the steam line isolation valve was closed. Heat transfer back to the primary system and heat loss to the environment caused the pressure to decrease steadily for the rest of the transient. The calculated pressure mirrored the measured value, with a nearly constant offset over the course of the transient. The pressure response in steam generators 3 and 4 was very similar to that in steam generator 1, but steam generator 2 behaved a little differently in the test. Figure 38 shows reductions in pressure coincident with the periods of accumulator injection. The accumulator injections appeared to move some liquid into the loop 2 steam generator tubes, increasing the heat transfer back to the primary system and causing the pressure to drop further than in the other steam generators.

Figure 39 presents the secondary side liquid levels in steam generator 1. The level increased at the beginning of the transient because feedwater flow was still being provided, but the heat transfer from the primary system was reduced because the core power was decreasing, resulting in less liquid being boiled in the steam generator. It continued to increase in the calculation until about 50 s as liquid drained from the feedwater ring and liquid that had been entrained into the upper region of the steam generator fell back into the measurement range as the boiling in the steam generator subsided. The level slowly decreased until about 100 s, when the primary system pressure dropped below the secondary system pressure. The level then decreased more rapidly, as heat transfer to the primary coolant system cooled the liquid in the steam generators, causing it to contract. The level then steadily decreased until about 250 s in the test, and about 150 s in the calculation, when the rate of decrease slowed, reflecting a slower depressurization in the primary coolant system.

The liquid level in steam generator 2 is shown in Figure 40. Behavior generally similar to that in steam generator 1 was observed, except that the liquid level was decreasing at the beginning of the transient because there was no feedwater being supplied. The measured behavior was also a bit unusual after about 300 s. The abrupt changes in level seem to be coincident with the accumulator injection cycles. Decreases in level might occur if the accumulator injection resulted in some liquid reaching the steam generator tubes, enhancing the heat transfer back to the primary system, thereby cooling the secondary side liquid (and hence reducing the specific volume and liquid level). There is no apparent explanation for the level increases, since the primary system pressure is well below that of the secondary system (precluding coolant expansion from causing the increase in measured level).

4.2 Sensitivity Cases

Sensitivity calculations were performed to investigate the impact of various parameters or code options on the predicted transient response. The major area of concern was the amount of liquid present in the upper plenum and core. A second concern was the heater rod temperature response.

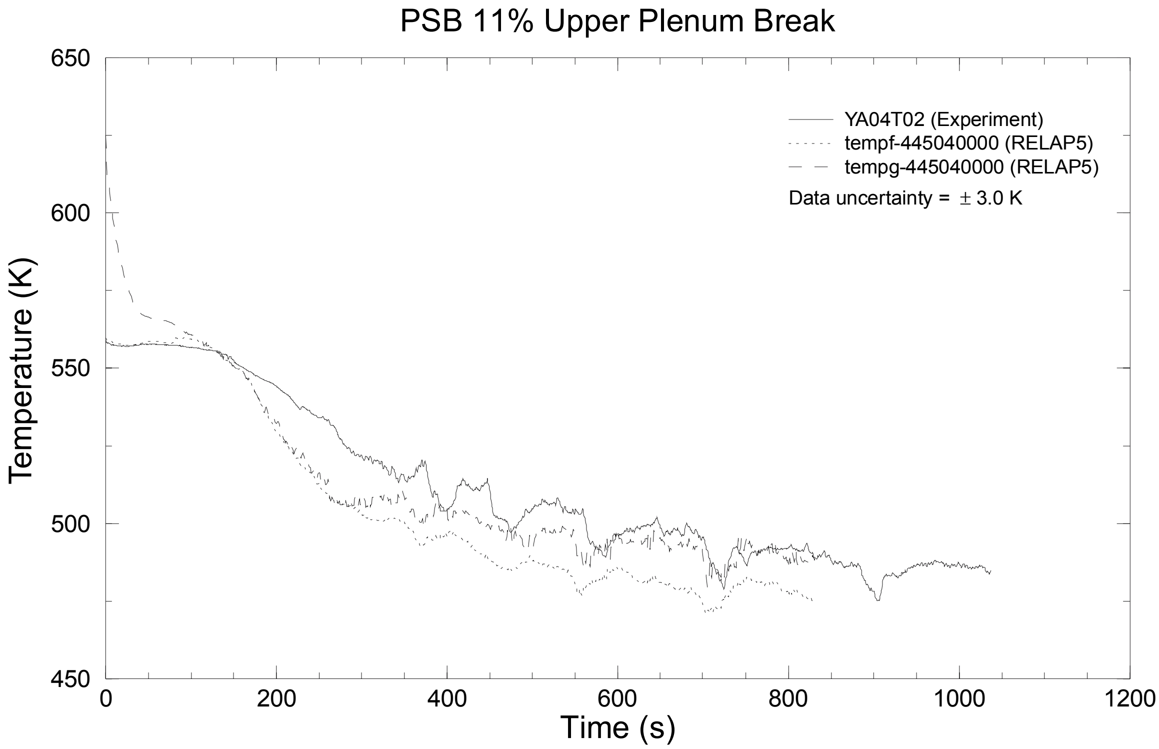

Figure 36. Loop 4 cold leg fluid temperature for the base case.

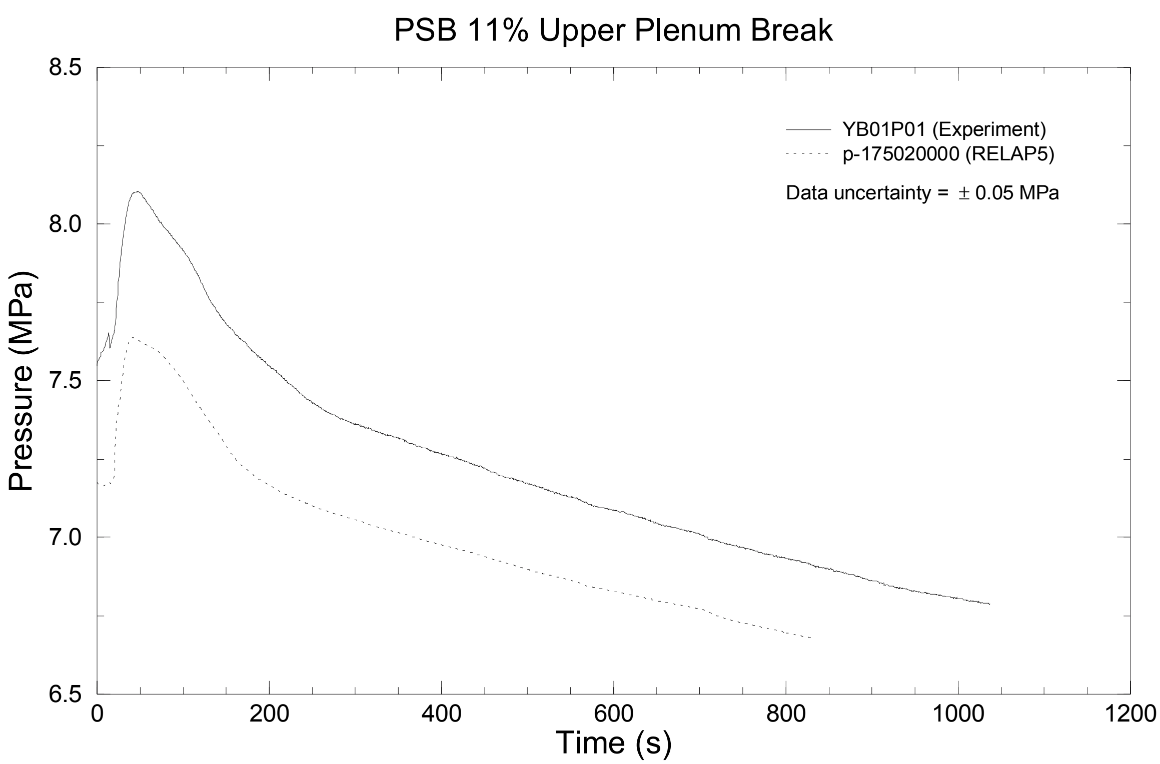

Figure 37. Loop 1 steam generator pressure for the base case.

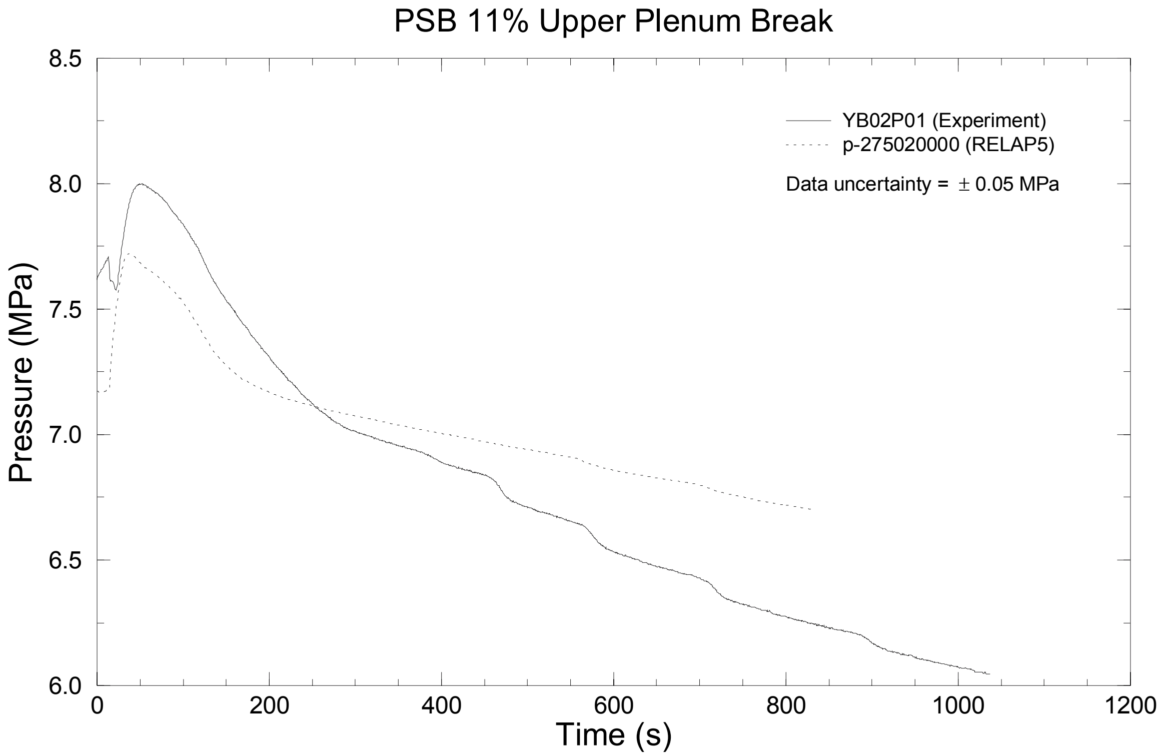

Figure 38. Loop 2 steam generator pressure for the base case.

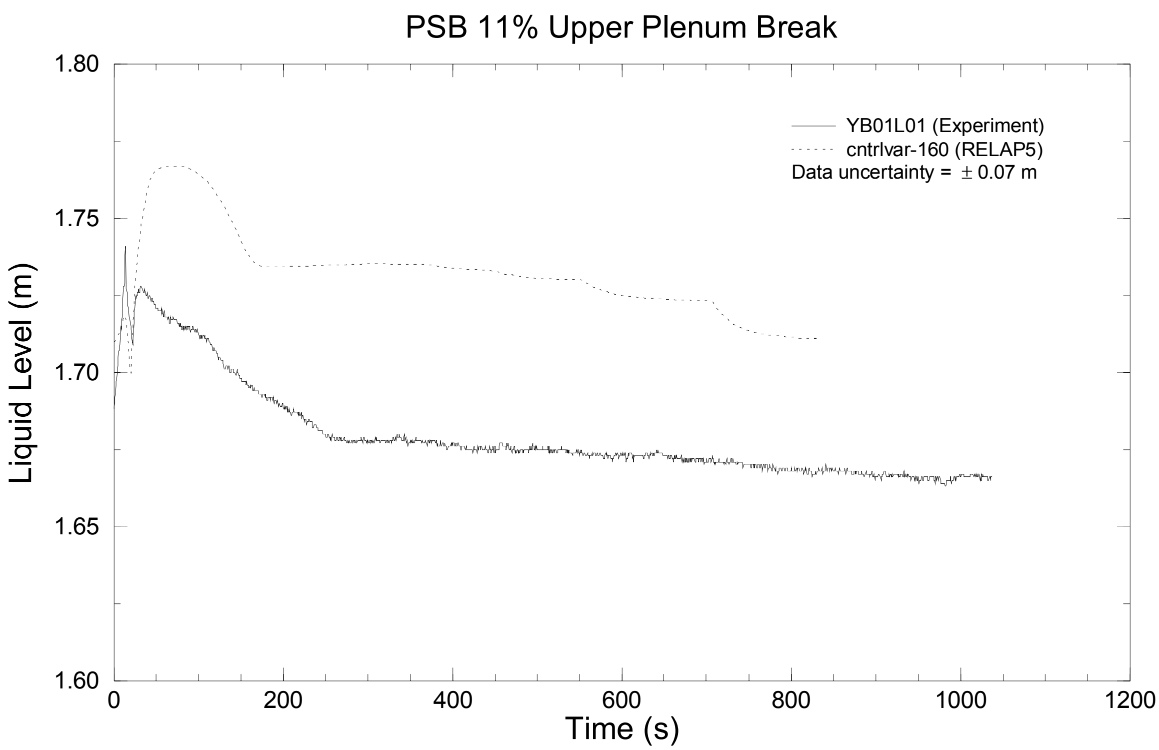

Figure 39. Loop 1 steam generator collapsed liquid level for the base case.

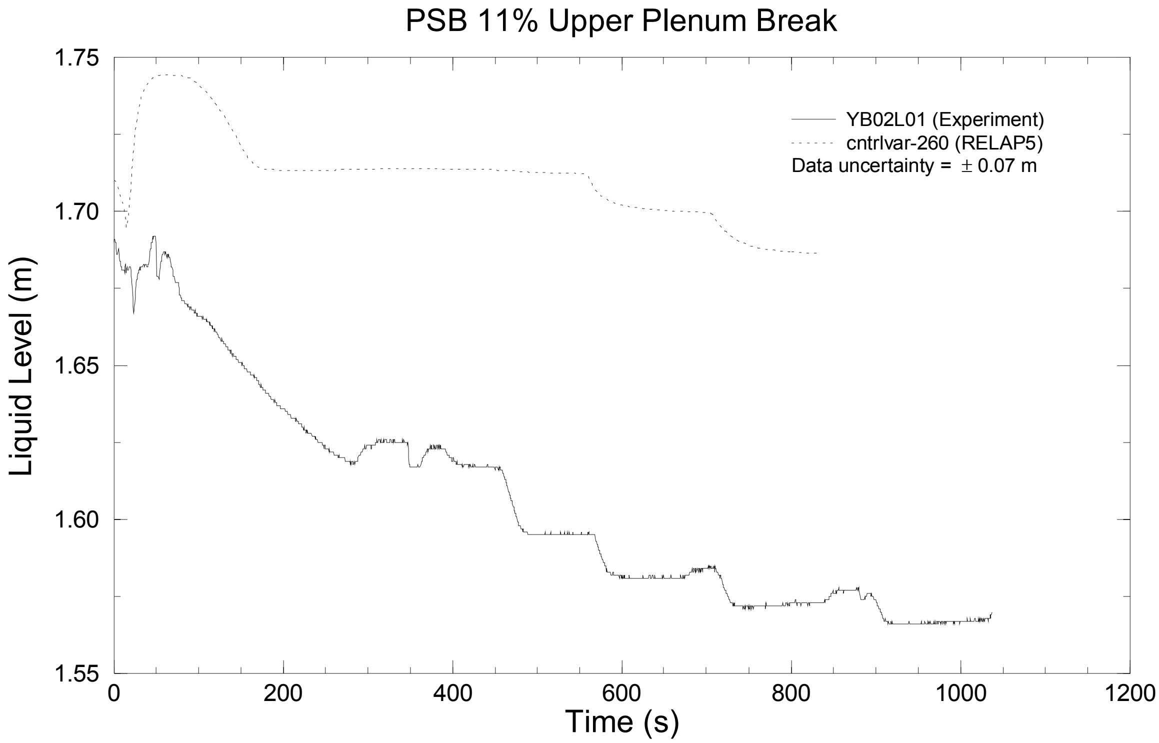

Figure 40. Loop 2 steam generator collapsed liquid level for the base case.

4.2.1 CCFL Off at Core Outlet

A sensitivity calculation was performed in which the CCFL model was turned off at the core exit (junction flag f set to 0 instead of 1). This provides a lower bound on the effects of the CCFL model by allowing the maximum amount of liquid to flow from the upper plenum back into the core. The objective of this run was to try to reduce the amount of liquid in the upper plenum.

The result showed little difference in any of the system parameters, except that the core heatup was significantly delayed because water penetration into the core from the upper accumulator injection helped cool the heater rods. Liquid inventories in the upper plenum, core, and downcomer were nearly the same as in the base case calculation. The heatup was also different in that the top portion of the heater rod remained cooled, with the maximum temperature occurring lower in the core, as illustrated in Figure 41.

4.2.2 Single Velocity Option at Core Outlet

In this calculation, the single velocity option was used at the core outlet junction (junction flag h set to 2 instead of 0). This prevented liquid from flowing from the upper plenum back down into the core by forcing the liquid to flow with the vapor. This calculation thus provided an upper bound on the possible CCFL effects.

Figure 42 shows that there was little material change in the amount of liquid in the core, compared to the base case calculation. With no liquid entering the top of the core, however, the core heatup was accelerated, as illustrated by the heater rod temperatures near the top of the core in Figure 43. As in the core, there was no noticeable change in the liquid inventory in the upper plenum, either.

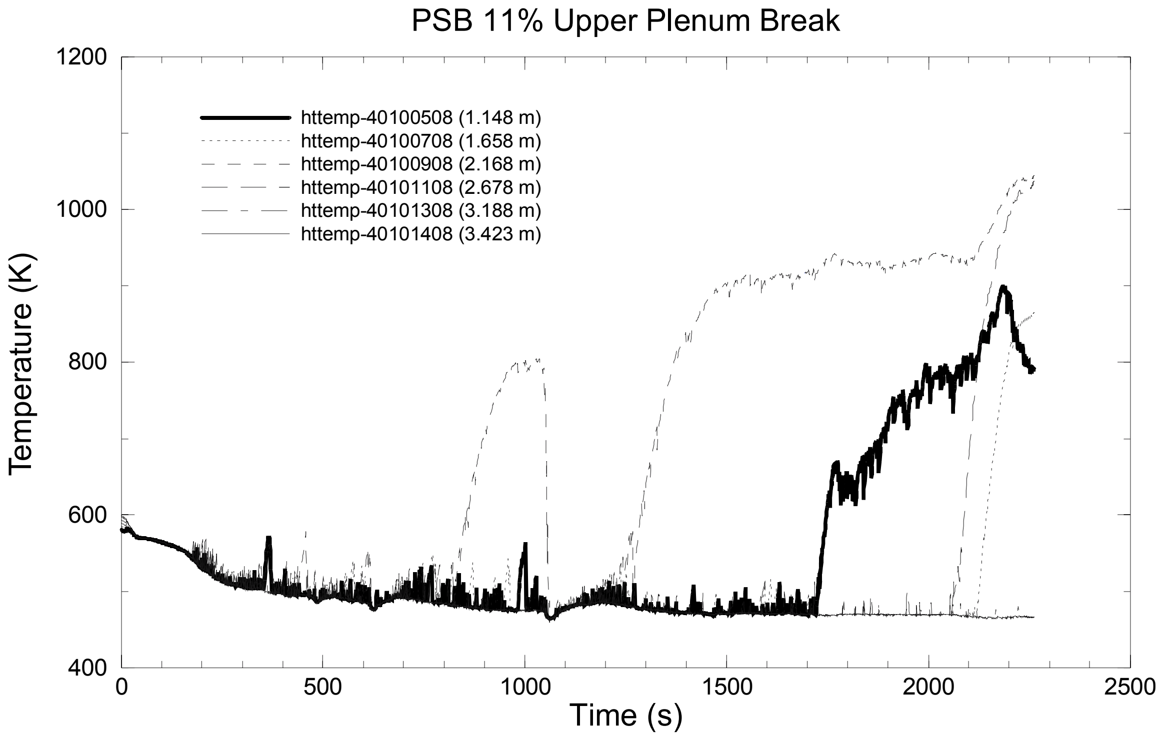

Figure 41. Calculated heater rod surface temperatures for the CCFL sensitivity case.

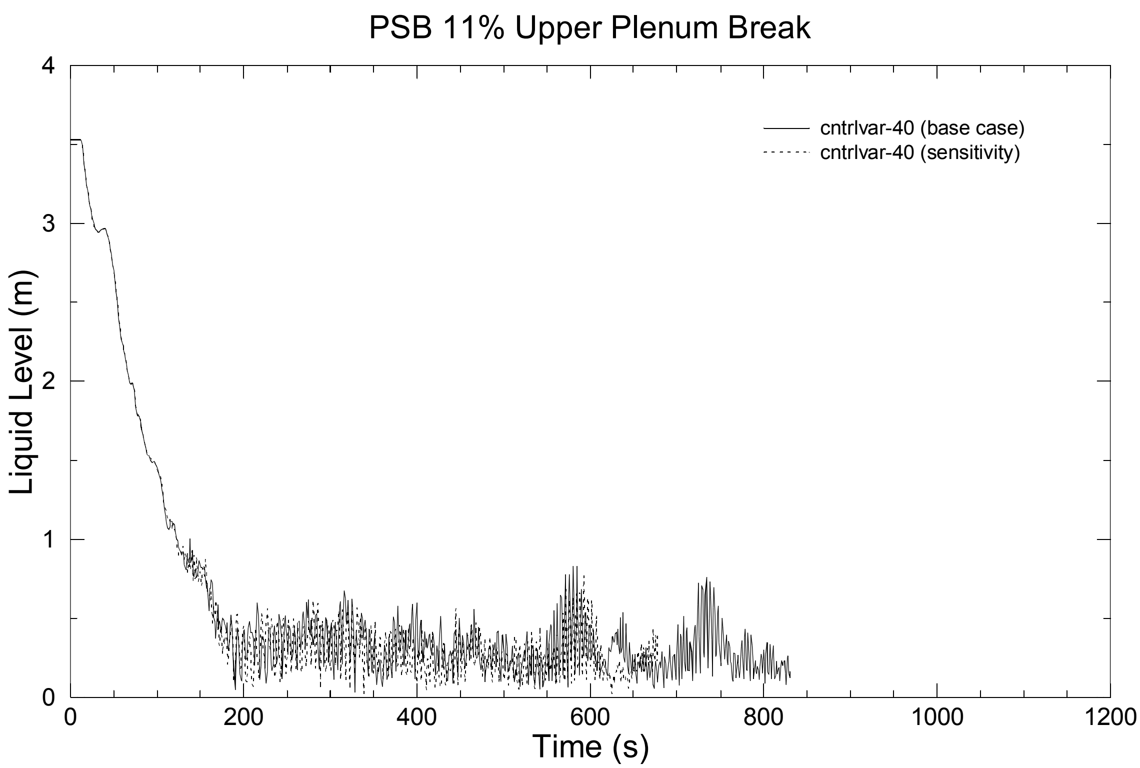

Figure 42. Core collapsed liquid level for the base and single velocity sensitivity cases.

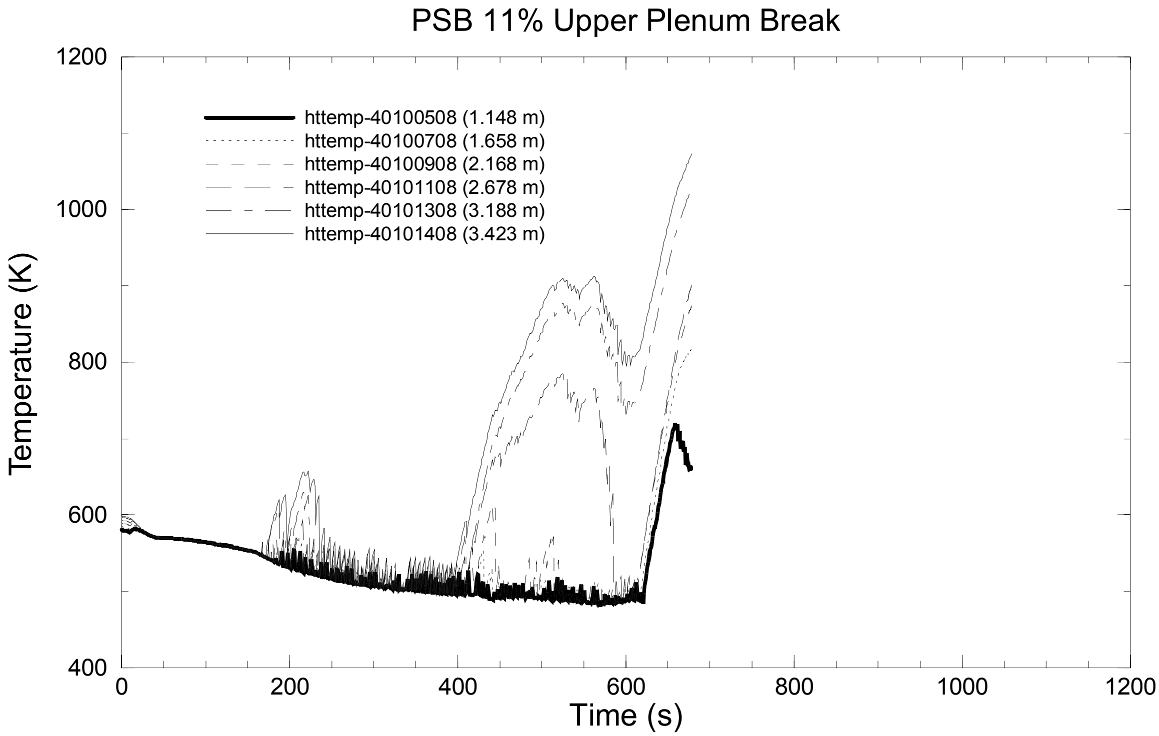

Figure 43. Calculated heater rod surface temperatures for the single velocity sensitivity case.

4.2.3 Reduced Drag in Upper Plenum

A sensitivity calculation was performed in which the bundle interphase drag model was turned on in the upper plenum region (volume flag b set to 1 instead of 0); this will tend to reduce the calculated drag. The objective was to reduce the amount of liquid in the upper plenum.

Figures 44 and 45 show that the amount of liquid in the upper plenum was reduced in the sensitivity calculation, resulting in better agreement with the measured data. The core liquid inventory was increased somewhat after 400 s. The effect on the heater rod temperatures is shown in Figure 46. The early, smaller heatups are more pronounced than in the base calculation (see Figure 31), and the heatup near 500 s is completely quenched in the sensitivity calculation (it was not in the base calculation) because of the additional water in the core. However, the calculation was terminated on high temperatures about 90 s earlier than in the base case.

4.2.4 Increased Drag in Core

A sensitivity calculation was performed in which the bundle interphase drag model was turned off in the core region (volume flag b set to 0 instead of 1); this will tend to increase the calculated drag.

In this calculation, more liquid was retained in both the core (see Figure 47) and the downcomer, while the liquid inventory in the upper plenum was essentially unchanged from the base case. The core liquid level also showed changes corresponding to the accumulator injection cycles that were much more obvious than in the base case calculation. The void profile in the core was also different, with the void fraction increasing with elevation in the core, whereas in the base case the void fraction was nearly constant along the core height.

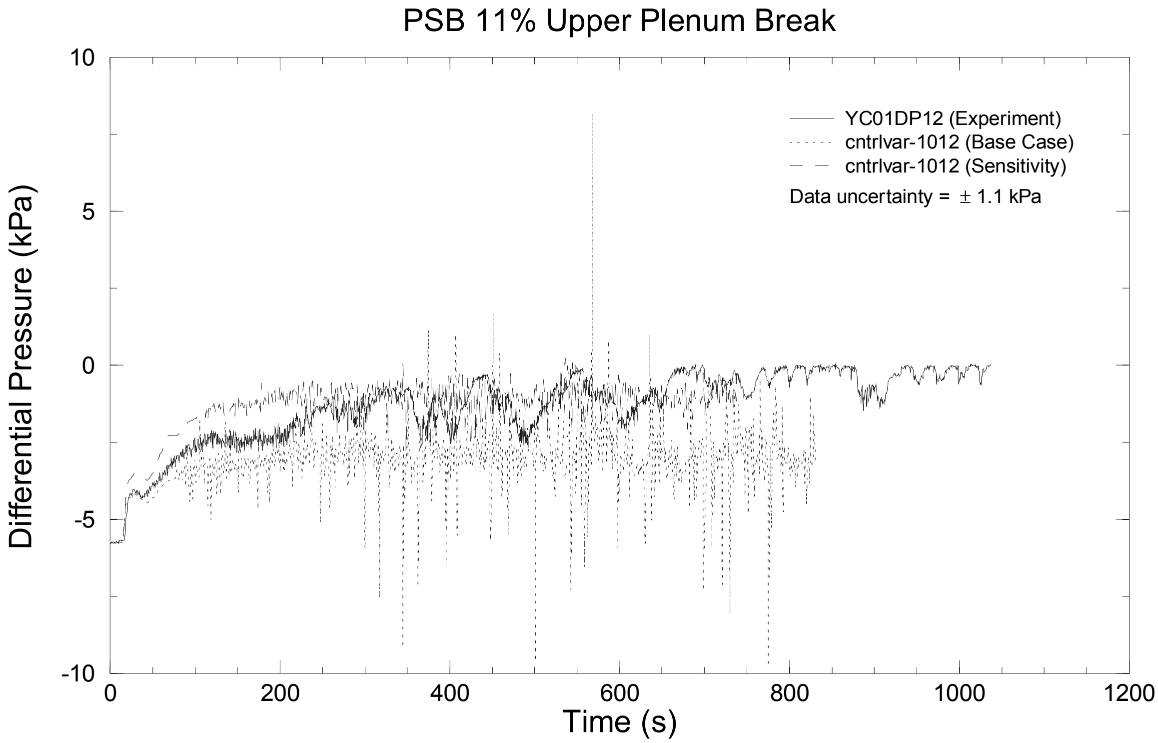

Figure 44. Differential pressure in the lower portion of the upper plenum for the base and upper plenum drag sensitivity cases.

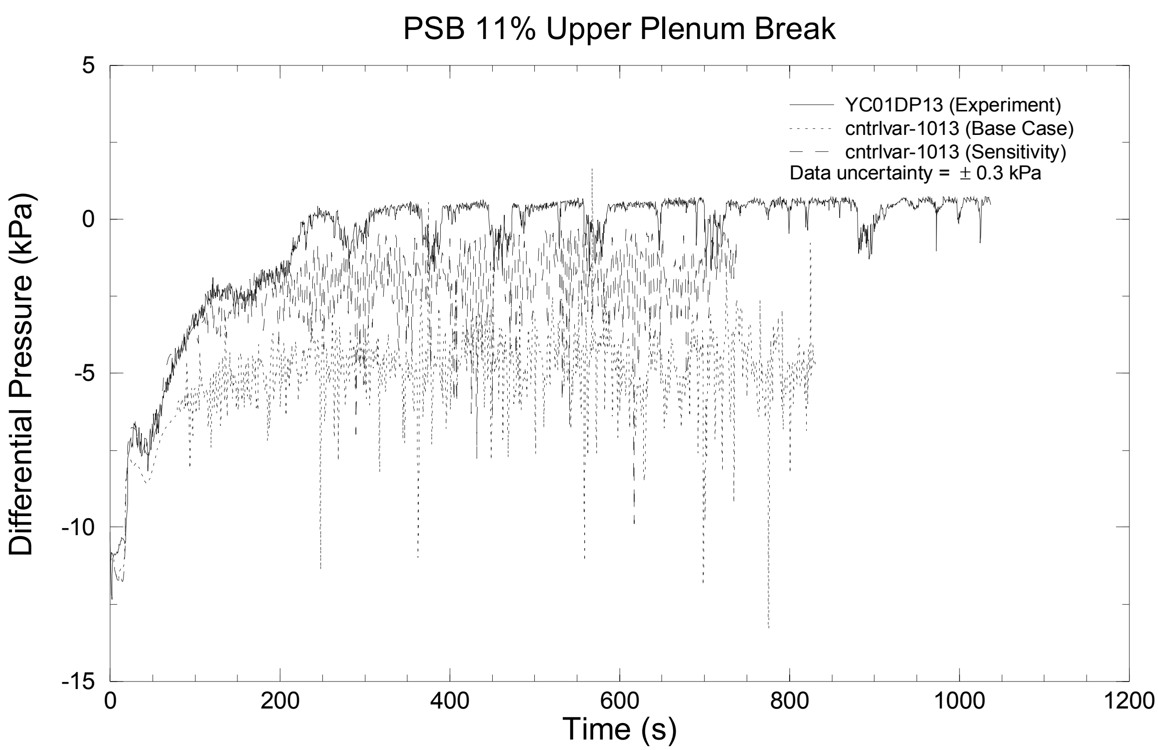

Figure 45. Differential pressure in the upper portion of the upper plenum for the base and upper plenum drag sensitivity cases.

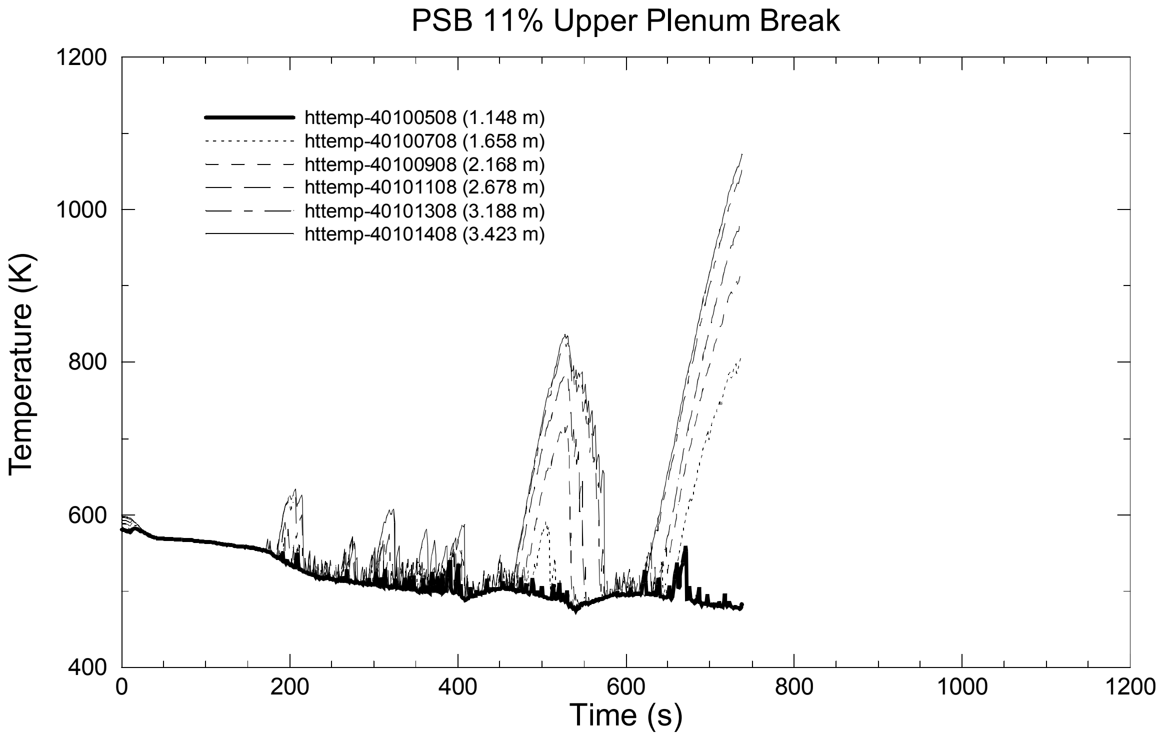

Figure 46. Calculated heater rod surface temperatures for the upper plenum drag sensitivity case.

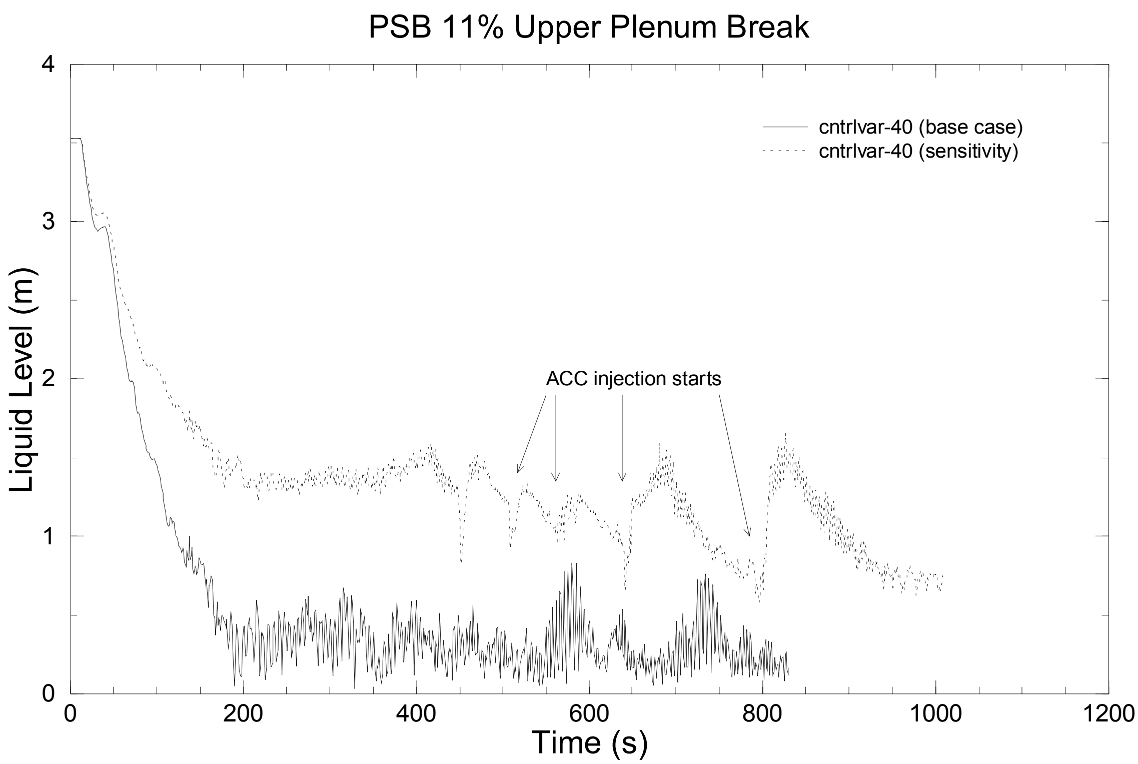

Figure 47. Core collapsed liquid level for the base and core drag sensitivity cases.

Figure 48 shows the resulting heater rod temperatures in the core. The numerous small heatups that were present in the base case calculation have been eliminated. The heatup behavior is more like that in the experiment, although the top of the core did not quench as often as in the test. The heatup is also delayed compared to the base case, resulting in the calculation being terminated on high temperatures at nearly the same time as the test.

4.3 Assessment Results

The assessment findings for the important phenomena expected to be addressed by the experiment are presented below.

Primary system two-phase natural circulation is judged to have been reasonably simulated by the code. Natural circulation flow only existed for a relatively short period in the test, with the hot collectors in the steam generators draining by 70 s and the primary coolant system pressure dropping below the secondary system pressure by 90 s. The loop flow rates were well predicted in making the transition from forced to natural convection, and the calculation was in excellent agreement with the measured data during the time the measurement was valid.

Asymmetric loop behavior is judged to be reasonably simulated, although it was not very important in either the test or the calculation. The only notable difference between the loops was the high pressure injection to the loop 4 hot leg. The effects of this injection, indications of much colder water in that hot leg, were seen in both the data and the calculation. The input model, which included all four loops in the facility explicitly, would allow differences in loop behavior in other transients to be simulated.

Leak flow is judged to be reasonably simulated. The fluid conditions upstream of the break were calculated well, reflecting both the transient liquid flow and the occasional liquid subcooling. With no

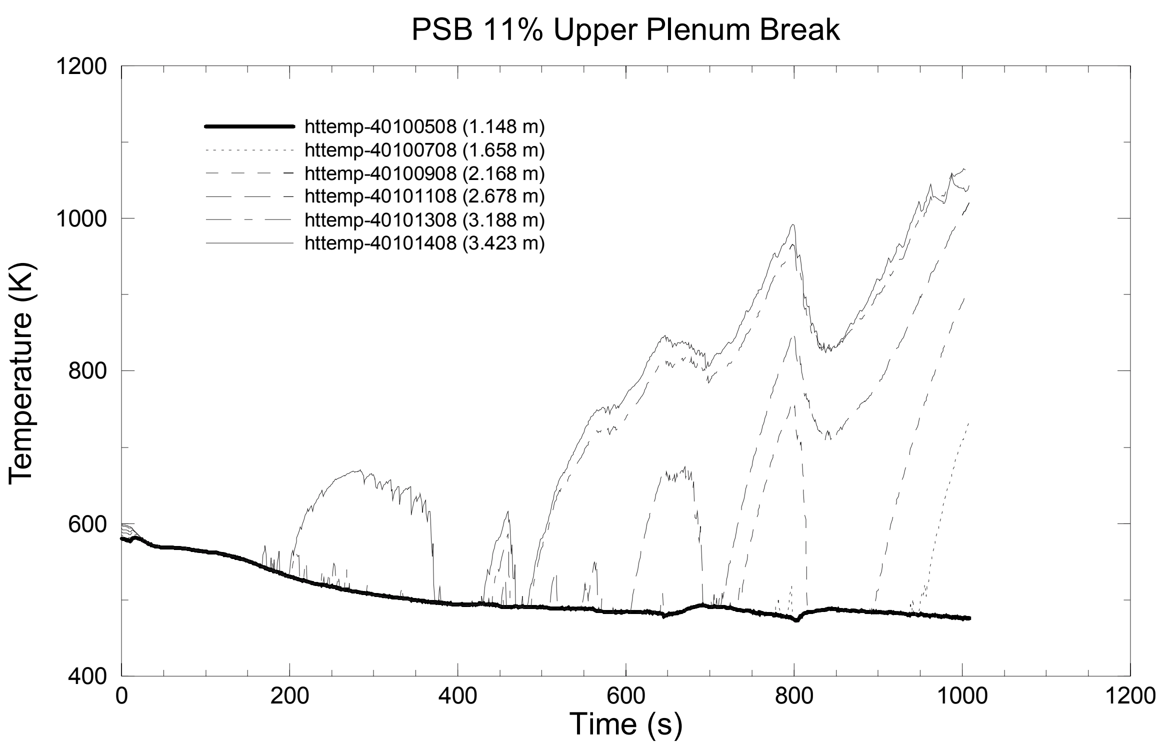

Figure 48. Calculated heater rod surface temperatures for the core drag sensitivity case.

break characterization data, an assumed set of discharge coefficients was used in the input model. Additional sensitivity calculations could be performed to find a set of discharge coefficients that would result in a close match to the data. There were no indications of problems with the RELAP5 critical flow model.

No judgment is made for the phenomenon of phase separation without mixture level formation. There were not detailed enough measurements to indicate if this occurred in any location in the system other than the core, where there were sufficient instruments but a mixture level existed.

The differential pressure measurements in the steam generators provide information on the collapsed liquid level, but by themselves do not provide sufficient information to make a judgment on mixture level and entrainment in the steam generator. There are no measurements in the steam generator to determine where the mixture level is, or how much liquid is being entrained either out of the tube bundle region or into the steam lines during the short period when the steam valves are open. The trend of the steam generator levels during the first 50 s indicates that the code may be overpredicting the amount of liquid being held above the measurement location, as more liquid appears to be falling back in the calculations than in the test. However, the steam generator feedwater is not at a steady state in the test, while it is in the calculation. Also, the steam generator geometry is not prototypic, and conclusions drawn from the experiment behavior would not necessarily apply to the horizontal steam generators in the power plants.

The code modeling of mixture level and entrainment in the core is judged to be minimal in the base case calculation. While the code correctly predicted the top-down uncovering and heatup, the void distribution in the core was much different from that in the test. The heater rods were heating up above the coolant saturation temperature over most of their length in the calculation, but not in the test. The impact of the accumulator injection on the core differential pressures observed in the test was not reproduced well by the code. The behavior was improved, however, in the sensitivity calculation with the bundle interphase drag model turned off in the core.

There were insufficient experiment data to address the phenomenon of flow stratification in horizontal pipes. No measurements were available to determine the flow regimes in the piping, so no judgment of the code's capability to model the phenomenon is made.

Loop seal clearance in the cold legs is judged to be reasonably simulated. While the calculated loop seal clearing occurred earlier than was measured, it did occur in both the test and calculation through the same mechanism. Condensation in the vessel associated with accumulator injection drew liquid from the loop seal toward the cold legs, where some of it flowed to the vessel. When the accumulator injection stopped, the liquid levels in the two sides of the loop seal equilibrated, but at successively lower levels with each accumulator injection cycle until the loop seal cleared.

No judgment is made on the code capability to model pool formation in the upper plenum because a pool did not form in either the test or the calculation. Based on the differential pressure measurements, the calculation retained more liquid in the upper plenum than was measured in the test. However, that liquid did not separate into a pool, remaining a fairly uniform two-phase mixture below the nozzle elevations.

Heat transfer in a covered core is judged to be reasonably simulated. The heat fluxes were low enough that the core remained in nucleate boiling until it began to uncover, and no early heatup was observed in the test or predicted by the code.

The code capability to model heat transfer in a partially uncovered core is judged to be reasonable. When the core was heating up, the heatup rate matched that in the test. In addition, the heatup rates differed axially in the core, with regions toward the center of the core heating up faster than did those toward the ends in both the calculation and the data.

The code is judged to reasonably simulate pressurizer thermal hydraulics in this test. The pressurizer behavior was relatively simple, with the liquid initially in the pressurizer either rapidly draining or flashing in response to the upper plenum break. The code adequately modeled the draining/flashing behavior, based on the good agreement in both the system pressure (affected by the flashing) and liquid level during the first 20 s of the transient.

The code's capability to model the integral system effects is judged to be reasonable. The shape of the measured pressure curve was similar to that of the test, indicating that all of the significant events that occurred in the test were present in the calculation. There were no phenomena in the test that were not present in the calculation, nor were there calculated behaviors that were not observed in the test.

5. SUMMARY/CONCLUSIONS

RELAP5/MOD3.2 calculations of an 11% upper plenum break in the PSB facility reasonably simulated the basic transient behavior. The experiment progression and controlling phenomena were well reproduced by the code. The code assessment findings for the high-ranked phenomena are summarized in Table 3.

Most of the phenomena that were present in the test were reasonably simulated by the code. The major difference between the test and the calculation was the timing of the core heatup, and the thermal response to the accumulator injection cycles. The calculation had a more extensive axial heatup, with most of the core experiencing small heatups. The accumulator injection was more effective in quenching the core in the test than in the calculation. This difference is attributed to the liquid distribution in the core, rather than to the heat transfer models in the code. The code calculation had a more uniform axial distribution of the liquid in the core, and the accumulator injection did not have much impact on the core liquid inventory. Based on this, the code simulation of the mixture level and entrainment in the core was judged to be minimal.

An improved simulation of the core behavior was achieved in the sensitivity calculation in which the interphase drag in the core was increased by turning off the bundle volume flag. The current user recommendation is to use the bundle flag in vertical rod bundles. These results suggest that that may not be appropriate for the VVER bundle geometry. However, this was only a single bundle, and the results may differ at full scale. Users should at least investigate the sensitivity of their results to the interphase drag modeling in the core.

Assessment judgments were not made for several phenomena, either because they did not occur in the test or because there were insufficient measurements to characterize them.

Table 3. Assessment results for high-ranked phenomena.

Phenomenon	Judgment
Primary system two-phase natural circulation	Reasonable
Asymmetric loop behavior	Reasonable
Leak flow	Reasonable
Phase separation without mixture level formation	None made
Mixture level and entrainment in the steam generator	None made
Mixture level and entrainment in the core	Minimal
Flow stratification in horizontal pipes	None made
Loop seal clearance in the cold legs	Reasonable
Pool formation in the upper plenum	None made
Heat transfer in a covered core	Reasonable
Heat transfer in a partially uncovered core	Reasonable
Pressurizer thermal-hydraulics	Reasonable
Integral system effects	Reasonable

6. REFERENCES

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2. V. N. Blinkov and A. G. Kraev, *Computer Code Validation for Transient Analysis of VVER and RBMK Reactors, Phase 4, Standard Problem Definition Report for INSCSP-PSBV1: 11% Upper Plenum Break*, International Nuclear Safety Center of Russian Minatom, 2002.

3. Idaho National Engineering Laboratory, *RELAP5/MOD3 Code Manual,* NUREG/CR-5535, INEL-95/0174, August 1995.

4. L. Guo, Z. Feng and X. Chen, "Transient convective heat transfer of steam-water two-phase flow in a helical tube under pressure drop type oscillations," *International Journal of Heat and Mass Transfer*, Vol. 45 (2002), pp. 533-542.

5. O. I. Melikhov, *PSB-VVER Heat Losses*, Electrogorsk 2002.

6. V. N. Blinkov and A. G. Kraev, *Computer Code Validation for Transient Analysis of VVER and RBMK Reactors, Phase 4, Experimental Data Report for INSCSP-PSBV1: 11% Upper Plenum Break Test*, International Nuclear Safety Center of Russian Minatom, 2002.

Appendix A

Input Listing for PSB RELAP5 Model

Appendix A
Input Listing for PSB RELAP5 Model

```
= psb model
*
* transient deck for SP-V1
*
* NOTE:  Calculations can be run either for a steady-state or a
*        transient.  By default the deck is configured for transient
*        calculations.  To invoke the steady-state options, enter the
*        following commands in "vi":
*
$*       :g/trancalc/s/^[0-9]/*&/
$*       :g/sscalc/s/^\*//
*
*        To reinvoke the transient options, enter the following commands
*        in "vi":
*
$*       :g/sscalc/s/^[0-9]/*&/
$*       :g/trancalc/s/^\*//
*
*==============================================================================*
0000100               new              transnt          *trancalc
*0000100               new              stdy-st          * sscalc
*-------------------------------------------------------------------------------
0000101               run
*-------------------------------------------------------------------------------
0000102              si                si
*-------------------------------------------------------------------------------
0000110   air nitrogen
0000115   1.0 0.0
0000120   024010000   1.340  h2o   primary  * vessel elevation reference
0000120   101010000   8.855  h2o   primary  * loop elevation reference
0000121   159010000  12.960  h2o   scndary  * feedwater ring
*-------------------------------------------------------------------------------
0000201   1500.   1.0e-8 0.050 0003   20    10000    200000       * trancalc
*0000201   3000.   1.0e-8 0.050 0019   40    20000    200000       * sscalc
*-------------------------------------------------------------------------------
***********************************************************************$
*                        ADDITIONAL RSTPLT VARIABLES                   $
***********************************************************************$
20800001  dt     0
20800002  dtcrnt 0
*
***********************************************************************$
*                            TRIPS                                     $
***********************************************************************$
20600000  expanded
*
20600010  time      0    ge  null  0  0.0  l  0.0 * always true
20600020  time      0    ge  null  0  1.e6 l -1.0 * always false
*
* bypass heater high temperature trip
20600500  cntrlvar 50    le  null  0  673. n  0.0 * heater on
*
* main circulation pump trips
20601400  time      0    le  null  0  10.0 n  0.0 * MCP1 running
```

```
20602400  time      0    le  null  0  10.0 n  0.0 * MCP2 running
20603400  time      0    le  null  0  10.0 n  0.0 * MCP3 running
20604400  time      0    le  null  0  10.0 n  0.0 * MCP4 running
20611400  -140   or     -140   n  -1.0
20612400  -240   or     -240   n  -1.0
20613400  -340   or     -340   n  -1.0
20614400  -440   or     -440   n  -1.0
*
* loop cold leg isolation valve trips
20601420  time      0    ge  null  0  0.0  l  0.0 * open cl1 vlv
20601430  time      0    ge  null  0  1.e6 l -1.0 * clos cl1 vlv
*
20602420  time      0    ge  null  0  0.0  l  0.0 * open cl2 vlv
20602430  time      0    ge  null  0  1.e6 l -1.0 * clos cl2 vlv
*
20603420  time      0    ge  null  0  0.0  l  0.0 * open cl3 vlv
20603430  time      0    ge  null  0  1.e6 l -1.0 * clos cl3 vlv
*
20604420  time      0    ge  null  0  0.0  l  0.0 * open cl4 vlv
20604430  time      0    ge  null  0  1.e6 l -1.0 * clos cl4 vlv
*
*  feedwater time dependent junction trips
20601510  time      0    ge  null  0  5.0  l -1.0
20601560  time      0    ge  null  0  0.0  l  0.0
*
20602510  time      0    ge  null  0  5.0  l -1.0
20602560  time      0    ge  null  0  0.0  l  0.0
*
20603510  time      0    ge  null  0  5.0  l -1.0
20603560  time      0    ge  null  0  0.0  l  0.0
*
20604510  time      0    ge  null  0  5.0  l -1.0
20604560  time      0    ge  null  0  0.0  l  0.0
*
*  steam generator safety valve trips
20601800  p 175020000    ge  null  0  13.65e6   n   -1.0 * reseat
20601810  p 175020000    ge  null  0  14.30e6   n   -1.0 * open
20611800  180    and    1181   n  -1.0
20611810  181    or     1180   n  -1.0 * valve control
*
20602800  p 275020000    ge  null  0  13.65e6   n   -1.0 * reseat
20602810  p 275020000    ge  null  0  14.30e6   n   -1.0 * open
20612800  280    and    1281   n  -1.0
20612810  281    or     1280   n  -1.0 * valve control
*
20603800  p 375020000    ge  null  0  13.65e6   n   -1.0 * reseat
20603810  p 375020000    ge  null  0  14.30e6   n   -1.0 * open
20613800  380    and    1381   n  -1.0
20613810  381    or     1380   n  -1.0 * valve control
*
20604800  p 475020000    ge  null  0  13.65e6   n   -1.0 * reseat
20604810  p 475020000    ge  null  0  14.30e6   n   -1.0 * open
20614800  480    and    1481   n  -1.0
20614810  481    or     1480   n  -1.0 * valve control
*
* steam line isolation valves
```

```
20601840  time      0    ge  null  0  5.0  l -1.0 * close
20601850  time      0    ge  null  0  1.e6 l -1.0 * open
*
20602840  time      0    ge  null  0  5.0  l -1.0 * close
20602850  time      0    ge  null  0  1.e6 l -1.0 * open
*
20603840  time      0    ge  null  0  5.0  l -1.0 * close
20603850  time      0    ge  null  0  1.e6 l -1.0 * open
*
20604840  time      0    ge  null  0  5.0  l -1.0 * close
20604850  time      0    ge  null  0  1.e6 l -1.0 * open
*
* surge line isolation valves
20605020  time      0    lt  null  0  -1.0 l -1.0 * open
20605030  time      0    lt  null  0  -1.0 l -1.0 * close
*
20605120  time      0    lt  null  0  -1.0 l -1.0 * open
20605130  time      0    lt  null  0  -1.0 l -1.0 * close
*
* pressurizer heater
20605300  p 062020000    le  null  0  15.4e6   n   -1.0 * low P
20605310  p 062020000    ge  null  0  17.0e6   n   -1.0 * high P
20605320  cntrlvar 530   ge  null  0   2.0     n    0.0 * level check
20605330  p 062020000    le  null  0  13.73e6  l   -1.0 * low-low P
20615300   530   or    1532   n  -1.0 * P low or heaters on
20615310  1530   and   -531   n  -1.0 * heaters on, P not high
20615320  1531   and    532   n  -1.0 * heaters on, level high enough
20615330  1532   and   -533   n  -1.0 * trip heaters on low-low P
*
* pressurizer safety relief valve
20605740  p 535010000    ge  null  0  17.00e6   n   -1.0 * opening
20605750  p 535010000    le  null  0  16.50e6   n   -1.0 * closing
20615720  1573   and   -575   n  -1.0 * opening, P>closing
20615730  1572   or     574   n  -1.0 * open valve
20615740  1575   and   -574   n  -1.0 * closing, P<opening
20615750  1574   or     575   n  -1.0 * close valve
*
* pressurizer PORV
20605840  p 535010000    ge  null  0  17.00e6   n   -1.0 * opening
20605850  p 535010000    le  null  0  16.50e6   n   -1.0 * closing
20615820  1583   and   -585   n  -1.0 * opening, P>closing
20615830  1582   or     584   n  -1.0 * open valve
20615840  1585   and   -584   n  -1.0 * closing, P<opening
20615850  1584   or     585   n  -1.0 * close valve
*
* isolate accumulator on low level
20606000  cntrlvar  600  gt  null  0  0.0  n  0.0 * accum 4 lvl
20606050  cntrlvar  605  gt  null  0  0.0  n  0.0 * accum 2 lvl
20606600  cntrlvar  660  gt  null  0  0.0  n  0.0 * accum 3 lvl
20606650  cntrlvar  665  gt  null  0  0.0  n  0.0 * accum 1 lvl
*
20606400  p  062020000  le  null  0  10.5+6  l -1.0 * hpis initiation
20606410  time 0        ge  timeof 640  0.7  l -1.0 * hpis delay
*
* break valve
20608010  time      0    ge  null  0  0.0  l -1.0 * break * trancalc
*20608010  time      0    ge  null  0  1.e6 l -1.0 * break * sscalc
*
*==============================================================================*
0100000   dcann1    branch
*------------------------------------------------------------------------------
*         no. juns  vel/flow
0100001   6         0
*         area                length          volume
0100101   0.009046            0.200           0.0
*         azim angle          incl angle      delta z
0100102   0.0                 -90.0           -0.200
*         roughness           hyd dia         pvbfe
0100103   4.57e-5             0.0357          00000
*         ebt
0100200     0    16910368.  1243288. 2411826. 0.
*         from      to        area      Kf    Kr    fvcahs
0101101   145010000 010010003 0.004536  1.10  0.280 001001
0102101   245010000 010010003 0.004536  1.10  0.280 001001
0103101   345010000 010010003 0.004536  1.10  0.280 001001
0104101   445010000 010010003 0.004536  1.10  0.280 001001
0105101   010010000 012000000 0.008171  0.0   0.0   001000
0106101   015020002 010000000 0.00669   0.321 0.295 001000
*         velf       velg     veli
0101201   .671443    .671443    0.   * 2.3
0102201   .67144     .67144     0.   * 2.3
0103201   .671417    .671417    0.   * 2.3
0104201   .700828    .700828    0.   * 2.4
0105201   .915137    .915137    0.   * 5.64652
0106201   -.723205   -.723205   0.   * -3.65348
*         hyd dia   beta      y-int     slope
0101110   0.076     0.00      1.00      1.00
0102110   0.076     0.00      1.00      1.00
0103110   0.076     0.00      1.00      1.00
0104110   0.076     0.00      1.00      1.00
0105110   0.040     0.00      1.00      1.00
0106110   0.0357    0.00      1.00      1.00
*==============================================================================*
0120000   dcann2    branch
*------------------------------------------------------------------------------
*         no. juns  vel/flow
0120001   1         0
*         area                length          volume
0120101   0.009660            0.200           0.0
*         azim angle          incl angle      delta z
0120102   0.0                 -90.0           -0.200
*         roughness           hyd dia         pvbfe
0120103   4.57e-5             0.040           00000
*         ebt
0120200     0    16911554.  1243288. 2411795. 0.
*         from      to        area      Kf    Kr    fvcahs
0121101   012010000 015050001 0.01005  0.253  0.312 001000
*         velf       velg     veli
0121201   .744037    .744037    0.   * 5.64652
*         hyd dia   beta      y-int     slope
0121110   0.040     0.00      1.00      1.00
*==============================================================================*
0150000             dc                pipe
*-----------------------------------------------------------------------------*
*hydro   no. volumes
0150001   17
*
*hydro   vol area    vol
0150101   0.01022      1
0150102   0.01922      2
0150103   0.01057      4
0150105   0.01553      5
0150106   0.01112     14
0150107   0.01000     15
0150108   0.008171    16
0150109   0.008541    17
*
*hydro   jun area    jun
0150201   0.01112      1
0150202   0.01057      4
0150203   0.01112     14
0150204   0.008171    16
*
*hydro  length       vol
0150301  0.525         1
0150302  0.390         2
```

```
0150303  0.200         4
0150304  0.560         5
0150305  0.475         6
0150306  0.275         7
0150307  0.470         8
0150308  0.510        14
0150309  0.355        15
0150310  0.460        16
0150311  0.826        17
*
*hydro   volume      vol
0150401   0.0        17
*
*hydro   vert angle  vol
0150601 -90.0        17
*
*hydro   delta z     vol
0150701  -0.525        1
0150702  -0.390        2
0150703  -0.200        4
0150704  -0.560        5
0150705  -0.475        6
0150706  -0.275        7
0150707  -0.470        8
0150708  -0.510       14
0150709  -0.355       15
0150710  -0.460       16
0150711  -0.826       17
*
*hydro   roughness  hyd diam  vol
0150801   4.57e-5     0.1025    1
0150802   4.57e-5     0.1356    2
0150803   4.57e-5     0.1160    4
0150804   4.57e-5     0.1077    5
0150805   4.57e-5     0.1190   14
0150806   4.57e-5     0.1064   15
0150807   4.57e-5     0.1020   17
*
*hydro    Kfwd       Krev     jun
0150901   0.196      0.141      1
0150902   0.204      0.0968     2
0150903   0.0        0.0        3
0150904   0.0949     0.0360     4
0150905   0.066      0.121      5
0150906   0.0        0.0       14
0150907   0.029      0.025     15
0150908   0.0        0.0       16
*
*hydro   fe         vol
0151001  00          17
*
*hydro  fvcahs       jun
0151101 001000         4
0151102 101000         5
0151103 001000        16
*
*hydro  ebt                                                 vol
0151201  0         16904682.   1242200.   2411972. 0.     0.   1
0151202  0         16908070.   1243211.   2411885. 0.     0.   2
0151203  0         16910172.   1243157.   2411831. 0.     0.   3
0151204  0         16911652.   1243103.   2411793. 0.     0.   4
0151205  0         16914298.   1243161.   2411725. 0.     0.   5
0151206  0         16917864.   1243136.   2411619. 0.     0.   6
0151207  0         16920620.   1243121.   2411538. 0.     0.   7
0151208  0         16923356.   1243096.   2411457. 0.     0.   8
0151209  0         16926956.   1243068.   2411350. 0.     0.   9
0151210  0         16930702.   1243041.   2411239. 0.     0.   10
0151211  0         16934448.   1243013.   2411128. 0.     0.   11
```

```
0151212  0         16938196.   1242986.   2411017. 0.     0.   12
0151213  0         16941942.   1242958.   2410906. 0.     0.   13
0151214  0         16945690.   1242931.   2410795. 0.     0.   14
0151215  0         16948760.   1242931.   2410704. 0.     0.   15
0151216  0         16951440.   1242931.   2410625. 0.     0.   16
0151217  0         16956190.   1242931.   2410484. 0.     0.   17
*                                              jun
0151301   -.03244253  -.0366568  0.             1  * -.272429
0151302   .423587     .481158  0.               2  * 3.38105
0151303   .423575     .48114   0.               3  * 3.38105
0151304   .423563     .481125  0.               4  * 3.38105
0151305   1.075024    1.174265 0.               5  * 9.02757
0151306   1.075007    1.174232 0.               6  * 9.02757
0151307   1.074996    1.17421  0.               7  * 9.02757
0151308   1.07498     1.174182 0.               8  * 9.02757
0151309   1.07496     1.174149 0.               9  * 9.02757
0151310   1.074941    1.174114 0.               10 * 9.02757
0151311   1.074923    1.17408  0.               11 * 9.02757
0151312   1.074904    1.174046 0.               12 * 9.02757
0151313   1.074885    1.174011 0.               13 * 9.02757
0151314   1.074866    1.173977 0.               14 * 9.02757
0151315   1.46279     1.575757 0.               15 * 9.02757
0151316   1.462786    1.57574  0.               16 * 9.02757
*         diamj       beta    c       m       jun
0151401   0.0         0.0     1.0     1.0      16
*
*==========================================================================*
0180000   lp1       branch
*--------------------------------------------------------------------------*
*         no. juns  vel/flow
0180001   2         0
*         area                length          volume
0180101   0.009613            0.826           0.0
*         azim angle          incl angle      delta z
0180102   0.0                 90.0            0.826
*         roughness           hyd dia         pvbfe
0180103   4.57e-5             0.040           00000
*         ebt
0180200     0    16955874.  1242872. 2410493. 0.
*         from      to        area      Kf    Kr    fvcahs
0181101   015170004 018010003 0.01968  2.23   2.53  001003
0182101   018010000 020000000 0.009613 0.094  0.026 001000
*         velf       velg     veli
0181201   .607335    .607335    0.   * 9.02757
0182201   1.24332    1.24332    0.   * 9.02757
*         hyd dia   beta      y-int     slope
0181110   0.012     0.00      1.00      1.00
0182110   0.040     0.00      1.00      1.00
*
*==========================================================================*
0200000   lp2       branch
*--------------------------------------------------------------------------*
*         no. juns  vel/flow
0200001   2         0
*         area                length          volume
0200101   0.008565            0.460           0.0
*         azim angle          incl angle      delta z
0200102   0.0                 90.0            0.460
*         roughness           hyd dia         pvbfe
0200103   4.57e-5             0.0355          00000
*         ebt
0200200     0    16950154.  1242836. 2410663. 0.
*         from      to        area      Kf    Kr    fvcahs
0201101   020010004 024000000 0.007854  0.236 1.21  001002
0202101   020010004 050000000 0.0009048 0.215 1.10  001002
*         velf       velg     veli
0201201   1.474078   1.474078   0.   * 8.7447
0202201   .4139      .4139      0.   * .2828664
```

```
*         hyd dia   beta      y-int     slope
0201110   0.100     0.00      1.00      1.00
0202110   0.024     0.00      1.00      1.00
*
*===============================================================================*
0220000   lp3       branch
*-------------------------------------------------------------------------------*
*         no. juns  vel/flow
0220001   1         0
*         area                length          volume
0220101   0.01797             0.284           0.0
*         azim angle          incl angle      delta z
0220102   270.                90.0            0.284
*         roughness           hyd dia         pvbfe
0220103   4.57e-5             0.0409          00000
*         ebt
0220200     0    1.696+7    1218121. 2410371. 0.
*         from      to        area      Kf    Kr    fvcahs
0221101   022010000 018000000 0.009613  0.319 0.370 001000
*         velf       velg     veli
0221201   -6.6416-10   -6.63999-10  0. * -4.82238-9
*         hyd dia   beta      y-int     slope
0221110   0.040     0.00      1.00      1.00
*===============================================================================*
0240000   connect   branch
*-------------------------------------------------------------------------------*
*         no. juns  vel/flow
0240001   1         0
*         area                length          volume
0240101   0.007854            0.586           0.0
*         azim angle          incl angle      delta z
0240102   270.                0.0             0.0
*         roughness           hyd dia         pvbfe
0240103   4.57e-5             0.100           00000
*         ebt
0240200     0    16949096.  1242807. 2410694. 0.
*         from      to        area      Kf    Kr    fvcahs
0241101   024010000 030010003 0.007854  0.736 0.214 001001
*         velf       velg     veli
0241201   1.47406    1.47406    0.   * 8.7447
*         hyd dia   beta      y-int     slope
0241110   0.100     0.00      1.00      1.00
*
**************************** JUNCTION  25 *****************************
*      dc to bypass
*=====================================================================
0250000   dc-byp   sngljun
*hydro    from          to           area      f loss    r loss   fvcahs
0250101   015000000  026000000       0.0        0.922     0.480   001000
*          Dhyd      beta      c        m
0250110    0.0       0.0      1.0      1.0
*
0250201    0         1.416852 1.416852 0. * .272429
*
*===============================================================================*
0260000             bypass            pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
0260001    2
*
*hydro   vol area    vol
0260101   0.0002545    2
*
*hydro   jun area    jun
0260201   0.0          1
*
*hydro  length       vol
0260301  0.9525        1
0260302  1.534         2
*
*hydro   volume      vol
0260401   0.0          2
*
*hydro   hor  angle  vol
0260501   0.0          1
0260502   270.0        2
*
*hydro   vert angle  vol
0260601  90.0          1
0260602  60.0          2
*
*hydro   delta z     vol
0260701   0.9525       1
0260702   1.1985       2
*
*hydro   roughness  hyd diam  vol
0260801   4.57e-5     0.018     2
*
*hydro    Kfwd       Krev     jun
0260901   0.045      0.045      1
*
*hydro   fe         vol
0261001  00          2
*
*hydro  fvcahs       jun
0261101 001000         1
*
*hydro  ebt                                                    vol
0261201  0          16897228.   1241612.   2412163. 0.     0.    1
0261202  0          16887874.   1240613.   2412404. 0.     0.    2
*                                                jun
0261301   1.41647     1.41647  0.              1 * .272429
*         diamj       beta    c       m        jun
0261401   0.0         0.0     1.0     1.0       1
*
**************************** JUNCTION 27  ***************************
* bypass isolation valve
*=================================================================$
0270000              byp-iso       valve
*-------------------------------------------------------------------
*
*hydro    from          to           area     kf    kr     vcahs
0270101   026010000     028000000     0.0      0.508 0.508  01000
*
0270201   0        1.415814 1.415814 0. * .272429
*
0270300   trpvlv
0270301     1
*
*===============================================================================*
0280000   bypass    branch
*-------------------------------------------------------------------------------*
*         no. juns  vel/flow
0280001   1         0
*         area                length          volume
0280101   0.0002652           0.8617          0.0
*         azim angle          incl angle      delta z
0280102   270.                0.0             0.0
*         roughness           hyd dia         pvbfe
0280103   4.57e-5             0.018           00000
*         ebt
0280200     0    16881842.  1240073. 2412559. 0.
*         from      to        area      Kf    Kr    fvcahs
0281101   028010000 062090002 0.002545  1.0   1.0   001001
*         velf       velg     veli
```

```
0281201   .1415462   .1415462   0.   * .272429
*         hyd dia   beta      y-int     slope
0281110   0.018     0.00      1.00      1.00
*
**************************** VOLUME  30 ******************************
* Unheated inlet section
*======================================================================
0300000        inlet           pipe
*----------------------------------------------------------------------
0300001   2
*
*         flow areas
0300101   0.0       2
*
*         Jct Flow Areas
0300201   0.01344    1
*         lengths
0300301   0.308    1
0300302   0.431    2
*
*         volumes
0300401   9.44784-3 1
0300402   6.1524-3  2
*
*         horiz     #
0300501   0.0       2
*
*         azimuth   #
0300601   90.0      2
*
*         deltaz
0300701   0.308    1
0300702   0.431    2
*
*         rough     dhyd
0300801   4.570e-5   0.0224       1
0300802   4.570e-5   9.9239-3     2
*
*         laminar wall friction
*0302501   1.0    0.0    1.0  0.0    1.0  0.0     1
*0302502   1.0    0.0    1.0  0.0    1.0  0.0     2
*
*         kfor      krev      #
0300901   1.482     1.384     1
*
*         pvbfe     #
0301001    00100     2
*
*         fvcahs    #
0301101    001000    1
*
*        volume ic
0301201  0   16949270. 1242731. 2410689. 0. 0.   1
0301202  0   16945686. 1242677. 2410795. 0. 0.   2
*
*
*         vel/flow
0301300   0
*
*        jct ic
301301   .861372        .861372  0.   1 * 8.7447
*
**************************** JUNCTION  35 ****************************
*      core inlet
*=====================================================================
0350000   corein   sngljun
*hydro    from          to            area      f loss    r loss   fvcahs
0350101   030020002  040010001       0.0         0.        0.     001000
```

```
0350102    1.        1.
*          Dhyd      beta      c        m
0350110   9.9239-3   0.0      0.775    1.0
*
0350201    0         .861354  .861354  0. * 8.7447
*
**************************** VOLUME  40 ******************************
* Core simulator region
*======================================================================
0400000        coresim         pipe
*----------------------------------------------------------------------
0400001   15
*
*         flow areas
0400101   0.01344    15
*
*         Jct Flow Areas
0400201   0.01344    14
*         lengths
0400301   0.255    13
0400302   0.215    14
0400303   0.275    15
*
*         volumes
0400401   0.0      15
*
*         horiz     #
0400501   0.0       15
*
*         azimuth   #
0400601   90.0      15
*
*         deltaz
0400701   0.255    13
0400702   0.215    14
0400703   0.275    15
*
*         rough     dhyd
0400801   4.570e-5   9.9239-3    15
*
*         laminar wall friction
*402501   1.0    0.0    1.0  0.0    1.0  0.0     1
*
* note add junction form losses based on pressure drop data
*         kfor      krev      #
0400901    0.0       0.0       14
*
*         pvbfe     #
0401001    00100     15
*
*         fvcahs    #
0401101    001000    14
*
*        volume ic
0401201  0   16942838. 1255071. 2410879. 0. 0.   1
0401202  0   16940738. 1267462. 2410942. 0. 0.   2
0401203  0   16938648. 1279848. 2411003. 0. 0.   3
0401204  0   16936568. 1292229. 2411065. 0. 0.   4
0401205  0   16934498. 1304608. 2411126. 0. 0.   5
0401206  0   16932438. 1316984. 2411187. 0. 0.   6
0401207  0   16930390. 1329355. 2411248. 0. 0.   7
0401208  0   16928350. 1341720. 2411309. 0. 0.   8
0401209  0   16926322. 1354081. 2411369. 0. 0.   9
0401210  0   16924304. 1366442. 2411428. 0. 0.   10
0401211  0   16922296. 1378796. 2411488. 0. 0.   11
0401212  0   16920300. 1391143. 2411547. 0. 0.   12
0401213  0   16918316. 1403482. 2411606. 0. 0.   13
0401214  0   16916494. 1413884. 2411660. 0. 0.   14
```

```
0401215  0   16914602. 1413841. 2411716. 0. 0.   15
*
*
*         vel/flow
0401300   0
*
*        jct ic
0401301   .866379        .866379  0.   1 * 8.7447
0401302   .871533        .871533  0.   2 * 8.7447
0401303   .876855        .876855  0.   3 * 8.7447
0401304   .882355        .882355  0.   4 * 8.7447
0401305   .887902        .887902  0.   5 * 8.7447
0401306   .893559        .893559  0.   6 * 8.7447
0401307   .899416        .899416  0.   7 * 8.7447
0401308   .905488        .905488  0.   8 * 8.7447
0401309   .911705        .911705  0.   9 * 8.7447
0401310   .917928        .917928  0.   10 * 8.7447
0401311   .924391        .924391  0.   11 * 8.7447
0401312   .931116        .931116  0.   12 * 8.7447
0401313   .938124        .938124  0.   13 * 8.7447
0401314   .944094        .944094  0.   14 * 8.7447
*
***************************** JUNCTION  45 *****************************
*      core tie plate
*======================================================================
0450000   tieplat  sngljun
*hydro    from          to           area      f loss    r loss   fvcahs
0450101   040150002  062010001       7.84e-3    0.78      0.67    100000
0450102    1.        1.
*          Dhyd      beta      c        m
0450110    5.5e-3    0.0      0.775    1.0
*
0450201    0         1.61841  1.61841  0. * 8.7447
*
***************************** VOLUME  50 ******************************
* Core bypass region
*=======================================================================
0500000        bypass         pipe
*-----------------------------------------------------------------------
0500001   10
*
*         flow areas
0500101   0.0010    1
0500102   0.00132   9
0500103   0.00145   10
*
*         Jct Flow Areas
0500201   0.0009048    1
0500202   7.70e-5      2
0500203   0.00132      8
0500204   7.70e-5      9
*
*         lengths
0500301   1.0375    1
0500302   0.585     2
0500303   0.510     3
0500304   0.510     8
0500305   0.636     9
0500306   2.1475    10
*
*         volumes
0500401   0.0      10
*
*         horiz     #
0500501   0.0       10
*
*         azimuth   #
0500601    0.0      1
```

```
0500602   90.0      9
0500603   15.78     10
*
*         deltaz
0500701   0.0       1
0500702   0.585     2
0500703   0.510     3
0500704   0.510     8
0500705   0.636     9
0500706   0.584     10
*
*         rough     dhyd
0500801   4.570e-5   0.0256      1
0500802   4.570e-5   0.041       9
0500803   4.570e-5   0.043       10
*
*         laminar wall friction
*402501   1.0    0.0    1.0  0.0    1.0  0.0     1
*
* note add junction form losses based on pressure drop data
*          kfor      krev      #
$0500901    1.451     0.288      1
$0500902    1.613     1.613      2
0500903    0.0       0.0        8
$0500904    2.419     2.419      9
* loss coefficients reduced based on model flow testing
0500901    0.10      0.1        1
0500902    0.25      0.25       2
0500904    0.25      0.25       9
*
*         pvbfe     #
0501001    00000     10
*
*
*         fvcahs    #
0501101    001000    9
*
*        volume ic
0501201  0   16950060. 1241742. 2410666. 0. 0.   1
0501202  0   16947874. 1241091. 2410730. 0. 0.   2
0501203  0   16941578. 1249155. 2410917. 0. 0.   3
0501204  0   16937810. 1257215. 2411028. 0. 0.   4
0501205  0   16934056. 1265269. 2411139. 0. 0.   5
0501206  0   16930316. 1273318. 2411250. 0. 0.   6
0501207  0   16926592. 1281361. 2411361. 0. 0.   7
0501208  0   16922882. 1289398. 2411471. 0. 0.   8
0501209  0   16918732. 1297283. 2411594. 0. 0.   9
0501210  0   1.6912+7  1294783. 2411783. 0. 0.   10
*
*         vel/flow
0501300   0
*
*        jct ic
0501301   .413684        .413684  0.   1 * .2828664
0501302   4.85957        4.85957  0.   2 * .2828664
0501303   .284553        .284553  0.   3 * .2828664
0501304   .285636        .285636  0.   4 * .2828664
0501305   .28674         .28674   0.   5 * .2828664
0501306   .287867        .287867  0.   6 * .2828664
0501307   .2890174       .2890174 0.   7 * .2828664
0501308   .290192        .290192  0.   8 * .2828664
0501309   4.99486        4.99486  0.   9 * .2828664
*
**************************** JUNCTION  55 ****************************
*      bypass outlet junction
*=====================================================================
0550000   bypout   sngljun
*hydro    from          to           area      f loss    r loss   fvcahs
```

```
0550101   050100002  062020001       1.4522-3   0.892     0.003    01000
0550102    1.        1.
*          Dhyd      beta      c        m
0550110    0.043     0.0      0.775    1.0
*
0550201    0         .2645067 .2645067 0. * .2828664
*
*===========================================================================*
0620000            up-plen           pipe
*---------------------------------------------------------------------------*
*
*hydro   no. volumes
0620001    9
*
*hydro   vol area    vol
0620101   0.03034      1
0620102   0.03440      2
0620103   0.03351      3
0620104   0.02720      4
0620105   0.02570      5
0620106   0.01057      7
0620107   0.02426      8
0620108   0.02573      9
*
*hydro   jun area    jun
0620201   0.03379      1
0620202   0.03205      2
0620203   0.05309      3
0620204   0.02573      4
0620205   0.01057      7
0620206   0.02573      8
*
*hydro  length       vol
0620301  0.475         1
0620302  0.775         2
0620303  0.575         3
0620304  0.525         4
0620305  0.475         5
0620306  0.200         7
0620307  0.638         9
*
*hydro   volume      vol
0620401   0.0          9
*
*hydro   vert angle  vol
0620601  90.0          9
*
*hydro   delta z     vol
0620701   0.475        1
0620702   0.775        2
0620703   0.575        3
0620704   0.525        4
0620705   0.475        5
0620706   0.200        7
0620707   0.638        9
*
*hydro   roughness  hyd diam  vol
0620801   4.57e-5     0.0634    1
0620802   4.57e-5     0.1346    2
0620803   4.57e-5     0.1975    3
0620804   4.57e-5     0.1069    4
0620805   4.57e-5     0.1809    5
0620806   4.57e-5     0.116     7
0620807   4.57e-5     0.1955    8
0620808   4.57e-5     0.181     9
*
*hydro    Kfwd       Krev      jun
0620901   0.493      0.597      1
0620902   0.149      0.235      2
0620903   0.431      0.544      3
0620904   0.191      0.266      4
0620905   0.096      0.036      5
0620906   0.0        0.0        6
0620907   0.096      0.204      7
0620908   0.0001     0.0056     8
*
*hydro   fe         vol
0621001  00           9
*
*hydro  fvcahs       jun
0621101 001000         3
0621102 101000         4
0621103 001000         8
*
*hydro  ebt                                                       vol
0621201  0         16911470.   1413773.   2411797. 0.     0.    1
0621202  0         16907218.   1409958.   2411907. 0.     0.    2
0621203  0         16902630.   1409895.   2412025. 0.     0.    3
0621204  0         16898864.   1409838.   2412121. 0.     0.    4
0621205  0         16895444.   1409780.   2412209. 0.     0.    5
0621206  0         16893152.   1409780.   2412268. 0.     0.    6
0621207  0         16891796.   1409770.   2412303. 0.     0.    7
0621208  0         1.6889+7    1397602.   2412375. 0.     0.    8
0621209  0         16884470.   1238540.   2412492. 0.     0.    9
*                                               jun
0621301   .375492     .375492  0.               1 * 8.7447
0621302   .407746     .471646  0.               2 * 9.02757
0621303   .246146     .297333  0.               3 * 9.02757
0621304   .507871     .578216  0.               4 * 9.02757
0621305   .491729     .552395  0.               5 * 3.59079
0621306   .491731     .552404  0.               6 * 3.59079
0621307   .491729     .552406  0.               7 * 3.59079
0621308   -.01399055  -.01517127 0.             8 * -.272432
*         diamj       beta    c       m        jun
0621401   0.0482      0.0     1.0     1.0       1
0621402   0.202       0.0     1.0     1.0       2
0621403   0.260       0.0     1.0     1.0       3
0621404   0.181       0.0     1.0     1.0       4
0621405   0.0         0.0     1.0     1.0       7
0621406   0.181       0.0     1.0     1.0       8
*
*===========================================================================*
0640000   upann1    branch
*---------------------------------------------------------------------------
*         no. juns  vel/flow
0640001   6         0
*         area                length          volume
0640101   0.009046            0.200           0.0
*         azim angle          incl angle      delta z
0640102   0.0                  90.0            0.200
*         roughness           hyd dia         pvbfe
0640103   4.57e-5             0.0357          00000
*         ebt
0640200     0    16891722.  1404707. 2412305. 0.
*         from      to        area      Kf    Kr    fvcahs
0641101   064010004 101000000 0.004536  0.280 1.10  001002
0642101   064010004 201000000 0.004536  0.280 1.10  001002
0643101   064010004 301000000 0.004536  0.280 1.10  001002
0644101   064010004 401000000 0.004536  0.280 1.10  001002
0645101   066010000 064000000 0.008171  0.0   0.0   001000
0646101   064010000 062080001 0.00669   0.295 0.321 001000
*         velf       velg     veli
0641201   .731678    .731678    0.   * 2.3
0642201   .731678    .731678    0.   * 2.3
0643201   .731678    .731678    0.   * 2.3
0644201   .76349     .76349     0.   * 2.4
```

```
0645201   .963116    .963116    0.   * 5.43678
0646201   -.829652   -.829652   0.   * -3.863225
*         hyd dia   beta      y-int     slope
0641110   0.076     0.00      1.00      1.00
0642110   0.076     0.00      1.00      1.00
0643110   0.076     0.00      1.00      1.00
0644110   0.076     0.00      1.00      1.00
0645110   0.040     0.00      1.00      1.00
0646110   0.0357    0.00      1.00      1.00
*===============================================================================*
0660000   upann2    branch
*--------------------------------------------------------------------------------
*         no. juns  vel/flow
0660001   1         0
*         area                length          volume
0660101   0.009660            0.200           0.0
*         azim angle          incl angle      delta z
0660102   0.0                  90.0            0.200
*         roughness           hyd dia         pvbfe
0660103   4.57e-5             0.040           00000
*         ebt
0660200     0    16892936.  1409780. 2412274. 0.
*         from      to        area      Kf    Kr    fvcahs
0661101   062050002 066000000 0.01005  0.312  0.253 001000
*         velf       velg     veli
0661201   .783043    .783043    0.   * 5.43678
*         hyd dia   beta      y-int     slope
0661110   0.040     0.00      1.00      1.00
**************************** JUNCTION  68 ****************************
*      upper core support plate
*======================================================================
0680000   ucsp     sngljun
*hydro    from          to           area      f loss    r loss   fvcahs
0680101   062010000  070000000       0.001885    1.450     1.452  101000
*          Dhyd      beta      c        m
0680110    0.020     0.30      2.0     1.0
*
0680201    0         -2.10201-6  -2.102034-6 0. * -3.00999-6
*===============================================================================*
0700000             up-head           pipe
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
0700001    2
*
*hydro   vol area    vol
0700101   0.02483      1
0700102   0.02542      2
*hydro   jun area    jun
0700201   0.02542      1
*
*hydro  length       vol
0700301  1.1975        2
*
*hydro   volume      vol
0700401   0.0          2
*
*hydro   vert angle  vol
0700601  90.0          2
*
*hydro   delta z     vol
0700701   1.1975       2
*
*hydro   roughness  hyd diam  vol
0700801   4.57e-5     0.1702    1
0700802   4.57e-5     0.1610    2
*
*hydro    Kfwd       Krev     jun
```

```
0700901   0.0        0.0        1
*
*hydro   fe         vol
0701001  00          2
*
*hydro  fvcahs       jun
0701101 001000        1
*
*hydro  ebt                                                    vol
*0701201  0          16877642.   1230474.   2412667. 0.     0.    1
*0701202  0          16868720.   1230277.   2412897. 0.     0.    2
0701201  3          16877642.   575.       0.       0.     0.    1
0701202  3          16868720.   575.       0.       0.     0.    2
*                                                   jun
0701301   1.60402-9   1.604185-9  0.           1 * 3.097456-8
*         diamj       beta    c       m        jun
0701401   0.0161      0.0     1.0     1.0       1
*
*#######################################################################
*                           LOOP 1                                     $
*                   PRIMARY COOLANT SYSTEM                             $
*#######################################################################
*
**************************** VOLUME 101 ******************************
* Loop 1 hot leg
*=======================================================================
1010000          hotleg1          pipe
*---------------------------------------------------------------------*
*
*hydro   no. volumes
1010001   7
*
*hydro   vol area    vol
1010101   0.004536     7
*
*hydro   jun area    jun
1010201   0.004536     6
*
*hydro  length       vol
1010301  0.6683        3
1010302  0.420         4
1010303  0.567         7
*
*hydro   volume      vol
1010401   0.0          7
*
*hydro   horiz ang   vol
1010501  45.0          7
*
*hydro   vert angle  vol
1010601   0.0          4
1010602  42.22         5
1010603  90.0          7
*
*hydro   delta z     vol
1010701   0.0          4
1010702   0.381        5
1010703   0.567        7
*
*hydro   roughness  hyd diam  vol
1010801   5.00e-5     0.076     7
*
*hydro    Kfwd       Krev     jun
1010901   0.0        0.0        3
1010902   0.25       0.25       4
1010903   0.0        0.0        6
*
*hydro   fe         vol
```

```
1011001  00          7
*
*hydro  fvcahs       jun
1011101 001000         6
*
*hydro  ebt                                                     vol
1011201  0          16891470.   1404572.   2412312. 0.     0.    1
1011202  0          16891440.   1404438.   2412312. 0.     0.    2
1011203  0          16891408.   1404304.   2412313. 0.     0.    3
1011204  0          16891384.   1404220.   2412314. 0.     0.    4
1011205  0          16890020.   1404107.   2412349. 0.     0.    5
1011206  0          16886770.   1403993.   2412433. 0.     0.    6
1011207  0          16882890.   1403880.   2412532. 0.     0.    7
*                                              jun
1011301   .731617     .731617  0.              1 * 2.3
1011302   .731557     .731557  0.              2 * 2.3
1011303   .731496     .731496  0.              3 * 2.3
1011304   .731458     .731458  0.              4 * 2.3
1011305   .731408     .731408  0.              5 * 2.3
1011306   .731361     .731361  0.              6 * 2.3
*
*         diamj       beta    c       m        jun
1011401   0.076       0.0     1.0     1.0       6
*
**************************** VOLUME 110 ******************************
* Steam generator 1 inlet transition region
*======================================================================
1100000   sginle1       branch
*------------------------------------------------------------------------------*
*         no. juns  vel/flow
1100001   2         0
*         area                length          volume
1100101   0.0                 0.210           0.00129
*         azim angle          incl angle      delta z
1100102   0.0                 90.0            0.210
*         roughness           hyd dia         pvbfe
1100103   5.00e-5             0.0             00000
*         ebt
1100200     0    16880318.  1403840. 2412599. 0.
*         from      to        area      Kf    Kr    fvcahs
1101101   101010000 110000000 0.004536 0.0    0.0   001000
1102101   110010000 115000000 0.004301 0.045  0.023 001000
*         velf       velg     veli
1101201   .731315    .731315    0.   * 2.3
1102201   .771258    .771258    0.   * 2.3
*         hyd dia   beta      y-int     slope
1101110   0.076     0.00      1.00      1.00
1102110   0.074     0.00      1.00      1.00
*
**************************** VOLUME 115 ******************************
* Steam generator 1 hot collector
*======================================================================
1150000          sg1hotc          pipe
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
1150001   5
*
*hydro   vol area    vol
1150101   0.0          1
1150102   0.003632     4
1150103   0.0          5
*
*hydro   jun area    jun
1150201   0.0          4
*
*hydro  length       vol
1150301  0.508        1
```

```
1150302  0.476         4
1150303  0.429         5
*
*hydro   volume      vol
1150401   0.001849     1
1150402   0.0          4
1150403   0.001588     5
*
*hydro   horiz ang   vol
1150501   0.0          5
*
*hydro   vert angle  vol
1150601  90.0          5
*
*hydro   delta z     vol
1150701  0.508         1
1150702  0.476         4
1150703  0.429         5
*
*hydro   roughness  hyd diam  vol
1150801   5.00e-5     0.068     5
*
*hydro    Kfwd       Krev     jun
1150901   0.0        0.0        4
*
*hydro   fe         vol
1151001  00          5
*
*hydro  fvcahs       jun
1151101 001000         4
*
*hydro  ebt                                                     vol
1151201  0          16877684.   1402171.   2412666. 0.     0.    1
1151202  0          16874404.   1400506.   2412751. 0.     0.    2
1151203  0          16871222.   1398460.   2412833. 0.     0.    3
1151204  0          16868020.   1395801.   2412915. 0.     0.    4
1151205  0          16864946.   1.392+6    2412994. 0.     0.    5
*                                              jun
1151301   .73562      .73562   0.              1 * 1.854402
1151302   .552481     .552481  0.              2 * 1.39415
1151303   .363967     .363967  0.              3 * .919592
1151304   .170144     .170144  0.              4 * .4305745
*
*         diamj       beta    c       m        jun
1151401   0.068       0.0     1.0     1.0       4
*
**************************** JUNCTION 116 *****************************
* junctions between the hot collector and the sg tubes
*======================================================================
1160000        hcjuns1         mtpljun
*----------------------------------------------------------------------
1160001    5        0
*
*  0nnm  from      to        area     kfor  krev  efvcahs  sub  2ph
1160011 115050004 125000000 0.0007964 0.005 0.002 0001002  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
1160012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
1161011     .774178      .774178        1 * .4305745
*
*  2nnm     Dhyd       b       c       m         #
1162011     0.013      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev  efvcahs  sub  2ph
1160021 115040004 124000000 0.0009291 0.005 0.002 0001002  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
1160022    -10000  -1000000   0         5
```

```
*
*  1nnm    velf         velg           #
1161021     .755398      .755398        2 * .489017
1161031     .734243      .734243        3 * .474558
1161041     .712996      .712996        4 * .4602525
1161051     .690997      .690997        5 * .445598
*
*  2nnm     Dhyd       b       c       m          #
1162021     0.013      1.0     2.0     1.0        5
*
***************************** VOLUME 121 ******************************
* Steam generator 1 tubes row 1 (7 tubes)
*=====================================================================
1210000          sg1tub1          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
1210001   10
*
*hydro   vol area    vol
1210101   0.0009291   10
*
*hydro   jun area    jun
1210201   0.0          9
*
*hydro  length       vol
1210301  1.0656       10
*
*hydro   volume      vol
1210401   0.0         10
*
*hydro   horiz ang   vol
1210501   0.0         10
*
*hydro   vert angle  vol
1210601   0.0          1
1210602  -0.343        9
1210603   0.0         10
*
*hydro   delta z     vol
1210701  0.0           1
1210702 -0.006375      9
1210703  0.0          10
*
*hydro   roughness  hyd diam  vol
1210801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
1210901   0.047      0.047      9
*
*hydro   fe         vol
1211001  00          10
*
*hydro  fvcahs       jun
1211101 001000         9
*
*hydro  ebt                                                     vol
1211201  0          16877310.   1346881.   2412676. 0.     0.   1
1211202  0          16876938.   1312265.   2412686. 0.     0.   2
1211203  0          16876596.   1290411.   2412694. 0.     0.   3
1211204  0          16876258.   1276593.   2412703. 0.     0.   4
1211205  0          16875920.   1267738.   2412712. 0.     0.   5
1211206  0          16875584.   1261983.   2412720. 0.     0.   6
1211207  0          16875250.   1258183.   2412729. 0.     0.   7
1211208  0          16874916.   1255631.   2412738. 0.     0.   8
1211209  0          16874582.   1253885.   2412746. 0.     0.   9
1211210  0          16874224.   1252668.   2412755. 0.     0.   10
*                                             jun
1211301   .66942      .66942   0.              1 * .445598
1211302   .657102     .657102  0.              2 * .445598
1211303   .649846     .649846  0.              3 * .445598
1211304   .645352     .645352  0.              4 * .445598
1211305   .642559     .642559  0.              5 * .445598
1211306   .640778     .640778  0.              6 * .445598
1211307   .639617     .639617  0.              7 * .445598
1211308   .638843     .638843  0.              8 * .445598
1211309   .638317     .638317  0.              9 * .445598
*
*         diamj       beta    c       m        jun
1211401   0.013       0.0     1.0     1.0       9
*
***************************** VOLUME 122 ******************************
* Steam generator 1 tubes row 2 (7 tubes)
*=====================================================================
1220000          sg1tub2          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
1220001   10
*
*hydro   vol area    vol
1220101   0.0009291   10
*
*hydro   jun area    jun
1220201   0.0          9
*
*hydro  length       vol
1220301  1.0656       10
*
*hydro   volume      vol
1220401   0.0         10
*
*hydro   horiz ang   vol
1220501   0.0         10
*
*hydro   vert angle  vol
1220601   0.0          1
1220602  -0.343        9
1220603   0.0         10
*
*hydro   delta z     vol
1220701  0.0           1
1220702 -0.006375      9
1220703  0.0          10
*
*hydro   roughness  hyd diam  vol
1220801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
1220901   0.047      0.047      9
*
*hydro   fe         vol
1221001  00          10
*
*hydro  fvcahs       jun
1221101 001000         9
*
*hydro  ebt                                                     vol
1221201  0          1.6874+7    1346356.   2412761. 0.     0.   1
1221202  0          16873610.   1312239.   2412771. 0.     0.   2
1221203  0          16873242.   1290567.   2412781. 0.     0.   3
1221204  0          16872878.   1276781.   2412790. 0.     0.   4
1221205  0          16872516.   1267897.   2412799. 0.     0.   5
1221206  0          16872156.   1262091.   2412809. 0.     0.   6
1221207  0          16871796.   1258238.   2412818. 0.     0.   7
1221208  0          16871438.   1255639.   2412827. 0.     0.   8
```

```
1221209  0          16871078.   1253853.   2412836. 0.     0.   9
1221210  0          16870696.   1252605.   2412846. 0.     0.   10
*                                             jun
1221301   .691236     .691236  0.               1 * .4602525
1221302   .678707     .678707  0.               2 * .4602525
1221303   .671274     .671274  0.               3 * .4602525
1221304   .666641     .666641  0.               4 * .4602525
1221305   .663745     .663745  0.               5 * .4602525
1221306   .661889     .661889  0.               6 * .4602525
1221307   .660673     .660673  0.               7 * .4602525
1221308   .659859     .659859  0.               8 * .4602525
1221309   .659303     .659303  0.               9 * .4602525
*
*         diamj       beta    c       m        jun
1221401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 123 ******************************
* Steam generator 1 tubes row 3 (7 tubes)
*=====================================================================
1230000          sg1tub3          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
1230001   10
*
*hydro   vol area    vol
1230101   0.0009291   10
*
*hydro   jun area    jun
1230201   0.0          9
*
*hydro  length       vol
1230301  1.0656       10
*
*hydro   volume      vol
1230401   0.0         10
*
*hydro   horiz ang   vol
1230501   0.0         10
*
*hydro   vert angle  vol
1230601   0.0          1
1230602  -0.343        9
1230603   0.0         10
*
*hydro   delta z     vol
1230701  0.0           1
1230702 -0.006375      9
1230703  0.0          10
*
*hydro   roughness  hyd diam  vol
1230801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
1230901   0.047      0.047      9
*
*hydro   fe         vol
1231001  00         10
*
*hydro  fvcahs       jun
1231101 001000         9
*
*hydro  ebt                                                       vol
1231201  0          16870800.   1345562.   2412844. 0.     0.   1
1231202  0          16870378.   1312030.   2412855. 0.     0.   2
1231203  0          1.687+7     1290606.   2412865. 0.     0.   3
1231204  0          16869594.   1276898.   2412875. 0.     0.   4
1231205  0          16869208.   1268016.   2412885. 0.     0.   5
```

```
1231206  0          16868822.   1262181.   2412895. 0.     0.   6
1231207  0          16868438.   1258291.   2412904. 0.     0.   7
1231208  0          16868054.   1255654.   2412914. 0.     0.   8
1231209  0          16867670.   1253836.   2412924. 0.     0.   9
1231210  0          16867262.   1252560.   2412935. 0.     0.   10
*                                             jun
1231301   .712408     .712408  0.               1 * .474558
1231302   .69973      .69973   0.               2 * .474558
1231303   .692155     .692155  0.               3 * .474558
1231304   .687405     .687405  0.               4 * .474558
1231305   .684419     .684419  0.               5 * .474558
1231306   .682495     .682495  0.               6 * .474558
1231307   .681228     .681228  0.               7 * .474558
1231308   .680377     .680377  0.               8 * .474558
1231309   .679793     .679793  0.               9 * .474558
*
*         diamj       beta    c       m        jun
1231401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 124 ******************************
* Steam generator 1 tubes row 4 (7 tubes)
*=====================================================================
1240000          sg1tub4          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
1240001   10
*
*hydro   vol area    vol
1240101   0.0009291   10
*
*hydro   jun area    jun
1240201   0.0          9
*
*hydro  length       vol
1240301  1.0656       10
*
*hydro   volume      vol
1240401   0.0         10
*
*hydro   horiz ang   vol
1240501   0.0         10
*
*hydro   vert angle  vol
1240601   0.0          1
1240602  -0.343        9
1240603   0.0         10
*
*hydro   delta z     vol
1240701  0.0           1
1240702 -0.006375      9
1240703  0.0          10
*
*hydro   roughness  hyd diam  vol
1240801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
1240901   0.047      0.047      9
*
*hydro   fe         vol
1241001  00         10
*
*hydro  fvcahs       jun
1241101 001000         9
*
*hydro  ebt                                                       vol
1241201  0          16867574.   1344358.   2412927. 0.     0.   1
1241202  0          16867124.   1311551.   2412938. 0.     0.   2
```

```
1241203  0          16866704.   1290469.   2412949. 0.     0.   3
1241204  0          16866288.   1276903.   2412960. 0.     0.   4
1241205  0          16865874.   1268064.   2412970. 0.     0.   5
1241206  0          16865464.   1262228.   2412981. 0.     0.   6
1241207  0          16865052.   1258317.   2412992. 0.     0.   7
1241208  0          16864642.   1255654.   2.413+6  0.     0.   8
1241209  0          16864232.   1253811.   2413013. 0.     0.   9
1241210  0          16863800.   1252512.   2413024. 0.     0.   10
*                                             jun
1241301   .733626     .733626  0.              1 * .489017
1241302   .720876     .720876  0.              2 * .489017
1241303   .713198     .713198  0.              3 * .489017
1241304   .708354     .708354  0.              4 * .489017
1241305   .705291     .705291  0.              5 * .489017
1241306   .703308     .703308  0.              6 * .489017
1241307   .701996     .701996  0.              7 * .489017
1241308   .70111      .70111   0.              8 * .489017
1241309   .7005       .7005    0.              9 * .489017
*
*         diamj       beta    c       m        jun
1241401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 125 ******************************
* Steam generator tubes 1 row 5 (6 tubes)
*=======================================================================
1250000          sg1tub5          pipe
*---------------------------------------------------------------------------*
*
*hydro   no. volumes
1250001   10
*
*hydro   vol area    vol
1250101   0.0007964   10
*
*hydro   jun area    jun
1250201   0.0          9
*
*hydro  length       vol
1250301  1.0656       10
*
*hydro   volume      vol
1250401   0.0         10
*
*hydro   horiz ang   vol
1250501   0.0         10
*
*hydro   vert angle  vol
1250601   0.0          1
1250602  -0.343        9
1250603   0.0         10
*
*hydro   delta z     vol
1250701  0.0           1
1250702 -0.006375      9
1250703  0.0          10
*
*hydro   roughness  hyd diam  vol
1250801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
1250901   0.047      0.047      9
*
*hydro   fe         vol
1251001  00          10
*
*hydro  fvcahs       jun
1251101 001000         9
*
```

```
*hydro  ebt                                                  vol
1251201  0          16864478.   1342369.   2413006. 0.     0.   1
1251202  0          1.6864+7    1310535.   2413019. 0.     0.   2
1251203  0          16863558.   1289975.   2413030. 0.     0.   3
1251204  0          16863118.   1276672.   2413042. 0.     0.   4
1251205  0          16862680.   1267959.   2413053. 0.     0.   5
1251206  0          16862242.   1262175.   2413064. 0.     0.   6
1251207  0          16861808.   1258280.   2413075. 0.     0.   7
1251208  0          16861374.   1255616.   2413086. 0.     0.   8
1251209  0          16860938.   1253763.   2413098. 0.     0.   9
1251210  0          16860482.   1252451.   2413109. 0.     0.   10
*                                             jun
1251301   .752753     .752753  0.              1 * .4305745
1251302   .740101     .740101  0.              2 * .4305745
1251303   .732416     .732416  0.              3 * .4305745
1251304   .727541     .727541  0.              4 * .4305745
1251305   .724442     .724442  0.              5 * .4305745
1251306   .722423     .722423  0.              6 * .4305745
1251307   .721081     .721081  0.              7 * .4305745
1251308   .72017      .72017   0.              8 * .4305745
1251309   .719541     .719541  0.              9 * .4305745
*
*         diamj       beta    c       m        jun
1251401   0.013       0.0     1.0     1.0       9
*
*************************** JUNCTION 128 ****************************
* junctions between the sg tubes and the cold collector
*=====================================================================
1280000        ccjuns1        mtpljun
*---------------------------------------------------------------------
1280001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
1280011 125010000 129050003 0.0007964 0.005  0.002  001001  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
1280012 000000000 000000000   0         1
*
*  1nnm    velf        velg           #
1281011     .719097      .719097        1 * .4305745
*
*  2nnm     Dhyd       b       c       m          #
1282011     0.013      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
1280021 124010000 129040003 0.0009291 0.005  0.002  001001  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
1280022  -1000000    -10000   0         5
*
*  1nnm    velf        velg           #
1281021     .700072      .700072        2 * .489017
1281031     .679385      .679385        3 * .474558
1281041     .658916      .658916        4 * .4602525
1281051     .637952      .637952        5 * .445598
*
*  2nnm     Dhyd       b       c       m          #
1282021     0.013      1.0     2.0     1.0        5
*
**************************** VOLUME 129 *****************************
* Steam generator 1 cold collector
*=====================================================================
1290000          sg1cldc          pipe
*---------------------------------------------------------------------------*
*
*hydro   no. volumes
1290001   6
*
*hydro   vol area    vol
1290101   0.0         1
```

```
1290102   0.003632     5
1290103   0.0          6
*
*hydro   jun area    jun
1290201   0.0          5
*
*hydro  length       vol
1290301  0.508         1
1290302  0.476         4
1290303  0.429         5
1290304  0.051         6
*
*hydro   volume      vol
1290401   0.001883     1
1290402   0.0          5
1290403   0.0002164    6
*
*hydro   horiz ang   vol
1290501   0.0          6
*
*hydro   vert angle  vol
1290601  90.0          6
*
*hydro   delta z     vol
1290701  0.508         1
1290702  0.476         4
1290703  0.429         5
1290704  0.051         6
*
*hydro   roughness  hyd diam  vol
1290801   5.00e-5     0.068     5
1290802   5.00e-5     0.074     6
*
*hydro    Kfwd       Krev     jun
1290901   0.0        0.0        4
1290902   0.016      0.032      5
*
*hydro   tlpvbfe    vol
1291001  0000000      6
*
*hydro   efvcahs    jun
1291101  0001000      5
*
*hydro  ebt                                                  vol
1291201  0         16874190.   1252437.   2412756. 0.     0.    1
1291202  0         16870660.   1252420.   2412847. 0.     0.    2
1291203  0         16867224.   1252404.   2412936. 0.     0.    3
1291204  0         16863760.   1252389.   2413025. 0.     0.    4
1291205  0         16860440.   1252378.   2413111. 0.     0.    5
1291206  0         16858672.   1263399.   2413156. 0.     0.    6
*                                            jun
1291301   -.679074    -.679074 0.              1 * -1.854402
1291302   -.51053     -.51053  0.              2 * -1.39415
1291303   -.336748    -.336748  0.             3 * -.919592
1291304   -.1576734   -.1576734 0.             4 * -.4305745
1291305   8.0974-11   8.11051-11  0.           5 * 2.21124-10
*
*         diamj       beta    c       m        jun
1291401   0.068       0.0     1.0     1.0       5
*
**************************** VOLUME 130 ******************************
* Steam generator 1 inlet transition region
*=====================================================================
1300000   sgoutlt1      branch
*----------------------------------------------------------------------------*
*         no. juns  vel/flow
1300001   2         0
*         area                length          volume
1300101   0.0                 0.159           0.001069
*         azim angle          incl angle      delta z
1300102   0.0                -90.0           -0.159
*         roughness           hyd dia         pvbfe
1300103   5.00e-5             0.0             00000
*         ebt
1300200     0    16876738.  1252436. 2412691. 0.
*         from      to        area      Kf    Kr    fvcahs
1301101   129000000 130000000 0.004301 0.023  0.045 001000
1302101   130010000 135000000 0.004536 0.0    0.0   001000
*         velf       velg     veli
1301201   .711244    .711244    0. * 2.3
1302201   .674394    .674394    0. * 2.3
*         hyd dia   beta      y-int     slope
1301110   0.074     0.00      1.00      1.00
1302110   0.076     0.00      1.00      1.00
*
**************************** VOLUME 135 ******************************
* Loop 1 pump suction piping of cold leg
*=====================================================================
1350000          pmpsct1          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
1350001   14
*
*hydro   vol area    vol
1350101   0.004536    10
1350102   0.0         11
1350103   0.004536    14
*
*hydro   jun area    jun
1350201   0.004536    13
*
*hydro  length       vol
1350301  0.828         5
1350302  1.042         7
1350303  1.121         8
1350304  0.7495       10
1350305  0.74525      14
*
*hydro   volume      vol
1350401   0.0         10
1350402   0.006897    11
1350403   0.0         14
*
*hydro   horiz ang   vol
1350501  95.0         14
*
*hydro   vert angle  vol
1350601 -90.0          8
1350602   0.0         10
1350603  90.0         14
*
*hydro   delta z     vol
1350701 -0.828         5
1350702 -0.7425        7
1350703 -0.935         8
1350704  0.0          10
1350705  0.64925      11
1350706  0.74525      14
*
*hydro   roughness  hyd diam  vol
1350801   5.00e-5     0.076    14
*
*hydro    Kfwd       Krev     jun
1350901   0.0        0.0        4
1350902   0.13       0.13       5
```

```
1350903   0.0        0.0        6
1350904   0.13       0.13       7
1350905   0.25       0.25       8
1350906   0.0        0.0        9
1350907   0.25       0.25      10
1350908   0.0        0.0       13
*
*hydro   tlpvbfe    vol
1351001  0000000     14
*
*hydro   efvcahs    jun
1351101  0001000     13
*
*hydro  ebt                                                   vol
1351201  0         16880264.   1252288.   2412600. 0.     0.   1
1351202  0         16886336.   1252141.   2412444. 0.     0.   2
1351203  0         16892406.   1251993.   2412288. 0.     0.   3
1351204  0         16898478.   1251846.   2412131. 0.     0.   4
1351205  0         16904550.   1251698.   2411975. 0.     0.   5
1351206  0         16910282.   1251512.   2411828. 0.     0.   6
1351207  0         16915714.   1251327.   2411683. 0.     0.   7
1351208  0         16921836.   1251127.   2411502. 0.     0.   8
1351209  0         16925202.   1250993.   2411402. 0.     0.   9
1351210  0         16925170.   1250860.   2411403. 0.     0.   10
1351211  0         16922842.   1250656.   2411472. 0.     0.   11
1351212  0         16917546.   1250523.   2411629. 0.     0.   12
1351213  0         1.6912+7    1250390.   2411783. 0.     0.   13
1351214  0         16906482.   1250257.   2411926. 0.     0.   14
*                                                jun
1351301   .674344     .674344  0.             1 * 2.3
1351302   .674292     .674292  0.             2 * 2.3
1351303   .67424      .67424   0.             3 * 2.3
1351304   .674188     .674188  0.             4 * 2.3
1351305   .674137     .674137  0.             5 * 2.3
1351306   .674073     .674073  0.             6 * 2.3
1351307   .67401      .67401   0.             7 * 2.3
1351308   .673941     .673941  0.             8 * 2.3
1351309   .673896     .673896  0.             9 * 2.3
1351310   .673854     .673854  0.             10 * 2.3
1351311   .673792     .673792  0.             11 * 2.3
1351312   .673754     .673754  0.             12 * 2.3
1351313   .673717     .673717  0.             13 * 2.3
*
*         diamj       beta    c       m       jun
1351401   0.076       0.0     1.0     1.0     13
*
***********************************  VOLUME 140  *******************************
* Loop 1 primary coolant pump
*
*======================================================================
1400000   mcp1       pump
*----------------------------------------------------------------------------*
*         area                length          volume
1400101   0.0                 0.746           0.010
*         azim angle     incl angle      delta z   pvbfe
1400102   0.0            30.0            0.370     00000
*         from      jun area  Kf    Kr    efvcahs
1400108   135010000 0.004536  0.0   0.0   0001000
*         to        jun area  Kf    Kr    efvcahs
1400109   142000000 0.004536  0.0   0.0   0001000
*         hyd dia   beta      y-int     slope
1400110   0.076     0.00      1.00      1.00
1400111   0.076     0.00      1.00      1.00
*         ebt
1400200     0    16907300.  1243953. 2411905. 0.
*         vel/flow  liquid    vapor     int-face
1400201   0         .67368    .67368    0. * 2.3
1400202   0         .671699   .671699   0. * 2.3
```

```
*         tabdat-i  2ph-i  2phdiff-i torque-i  pvel-i  trip  rev-i
1400301   -2        -1     -3        -1        0       1140  1
*         rated vel  in/rated vel  rated flow  rated head
1400302   314.2      .1243596      0.022       100.
*         rated torq   mom-iner  rated dens  rated m-torq
1400303   57.2         3.7-2     750.0       0.00
*         coeff-tf2  coeff-tf0  coeff-tf1  coeff-tf3
1400304   0.57       0.57       0.0       0.0
*
*hydro        trip no.          parameter no.
1406100         140            cntrlvar  140
*
*hydro        indp var          speed (rad/s)
1406101        -1.0             314.2
1406102         0.0                0.
1406103       500.0              500.
*
****************************** VOLUME 142 ******************************
* Piping from pump discharge to isolation valve
*==================================================================$
*hydro             component name      component type
1420000               pmp1out            snglvol
*------------------------------------------------------------------$
*hydro            area               length              volume
1420101           0.004536           0.880               0.0
*
*hydro         horz angle          vert angle           delta z
1420102        -100.0                0.0                  0.0
*
*hydro          roughness           hyd diam               fe
1420103          0.00005            0.076                 00
*
*hydro  ebt  pressure     tempe
1420200   0    16910562.  1243707. 2411821. 0.
*
**************************** JUNCTION 143 ****************************
* Cold leg isolation valve
*=================================================================$
1430000               cl1vlv       valve
*---------------------------------------------------------------------
*
*hydro    from          to            area     kf    kr     vcahs
1430101   142010000     145000000    0.004536 0.0    0.0    00100
*
1430201   0        .671617 .671617 0. * 2.3
*
1430300   mtrvlv
*
*         open  close  rate  ic
1430301   142   143    0.1   1.
*
**************************** VOLUME 145 ******************************
* Loop 1 reactor vessel inlet section of cold leg
*=====================================================================
1450000          cldleg1          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
1450001   4
*
*hydro   vol area    vol
1450101   0.004536     4
*
*hydro   jun area    jun
1450201   0.004536     3
*
*hydro  length       vol
1450301  0.782        3
```

```
1450302  0.741         4
*
*hydro   volume      vol
1450401   0.0         4
*
*hydro   horiz ang   vol
1450501  -100.0        3
1450502  -145.0        4
*
*hydro   vert angle  vol
1450601   0.0         4
*
*hydro   delta z     vol
1450701   0.0         4
*
*hydro   roughness  hyd diam  vol
1450801   5.00e-5     0.076     4
*
*hydro    Kfwd       Krev     jun
1450901   0.0        0.0       2
1450902   0.16       0.16      3
*
*hydro   fe         vol
1451001  00          4
*
*hydro  fvcahs       jun
1451101 001000         3
*
*hydro  ebt                                                 vol
1451201  0          16910528.   1243568.   2411822. 0.     0.    1
1451202  0          16910496.   1243430.   2411822. 0.     0.    2
1451203  0          16910462.   1243291.   2411823. 0.     0.    3
1451204  0          16910402.   1243160.   2411825. 0.     0.    4
*                                              jun
1451301   .671573     .671573  0.              1 * 2.3
1451302   .671529     .671529  0.              2 * 2.3
1451303   .671484     .671484  0.              3 * 2.3
*
*         diamj       beta    c       m        jun
1451401   0.076       0.0     1.0     1.0       3
*
*########################################################################
*                             LOOP 1                                     $
*                      SECONDARY COOLANT SYSTEM                          $
*########################################################################
**************************** VOLUME 150 ******************************
* Loop 1 Main Feedwater source
*====================================================================
1500000   mfw1src   tmdpvol
*--------------------------------------------------------------------*
*         area                length          volume
1500101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
1500102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
1500103   0.00000             0.0000          00010
*         ebt       trip          search var
1500200   003       0
*         indep var
1500201   0.00     10.0e6     443.15
*
**************************** JUNCTION 151 ****************************
* Loop 1 main feedwater flow
*====================================================================
1510000   mfw1      tmdpjun
*
*         From      To        Area
1510101   150010000 159000000 0.0009079
*
*        vel/Kg     trip      var req.  # var req
1510200   1         151                                 * trancalc
*
*         Time    kg/s      kg/s      m/s
1510201    0.0    0.1666    0.        0.              * trancalc
1510202    7.0    0.1666    0.        0.              * trancalc
1510203    8.0    0.0       0.        0.              * trancalc
*
**************************** VOLUME 155 ******************************
* Loop 1 Auxiliary Feedwater source
*====================================================================
1550000   afw1src  tmdpvol
*--------------------------------------------------------------------*
*         area                length          volume
1550101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
1550102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
1550103   0.00000             0.0000          00010
*         ebt       trip          search var
1550200   003       0
*         indep var
1550201   0.00     16.0e6     443.15
*
**************************** JUNCTION 156 ****************************
* Loop 1 auxiliary feedwater flow
*====================================================================
1560000   afw1      tmdpjun
*
*         From      To        Area
1560101   155010000 159000000 0.0009079
*
*        vel/Kg     trip      var req.  # var req
1560200   1         156
*
*         Time    kg/s      kg/s      m/s
1560201   -1.     0.0       0.        0.
1560202    0.0    0.0       0.        0.
*
**************************** VOLUME 159 ******************************
* Loop 1 Feedwater ring
*====================================================================
1590000   fwring1    branch
*----------------------------------------------------------------------------
*         no. juns  vel/flow
1590001   1         0
*         area                length          volume
1590101   0.0009079           1.062           0.0
*         azim angle          incl angle      delta z
1590102   0.0                   0.0             0.000
*         roughness           hyd dia         pvbfe
1590103   5.0e-5              0.034           00000
*         ebt
1590200     0    7175378.   1084847. 2580092. .457357
*         from      to        area      Kf    Kr    fvcahs
1591101   159010000 172010003 0.009651 0.0    0.0   001000
*         velf       velg     veli
1591201   .0478604   -.1377204  0.   * .1666344
*         hyd dia   beta      y-int     slope
1591110   0.008     0.00      1.00      1.00
*
*********************************************************************
* These components have been superseded.  They are being left in the
* input deck for possible future use.
*********************************************************************
*
**************************** VOLUME 160 ******************************
```

```
* Loop 1 sg downcomer
*====================================================================
$1600000             dc1           annulus
*--------------------------------------------------------------------------*
*
*hydro   no. volumes
$1600001    5
*
*hydro   vol area    vol
$1600101   0.0         5
*
*hydro   jun area    jun
$1600201   0.0         4
*
*hydro  length       vol
$1600301  0.374        1
$1600302  0.476        4
$1600303  0.563        5
*
*hydro   volume      vol
$1600401   0.00987     1
$1600402   0.01256     4
$1600403   0.01486     5
*
*hydro   vert angle  vol
$1600601  -90.0        5
*
*hydro   delta z     vol
$1600701  -0.374       1
$1600702  -0.476       4
$1600703  -0.563       5
*
*hydro   roughness  hyd diam  vol
$1600801   1.0e-5      0.04      5
*
*hydro    Kfwd       Krev     jun
$1600901   0.0        0.0        4
*
*hydro   fe         vol
$1601001  00          5
*
*hydro  fvcahs       jun
$1601101 001000         4
*
*hydro  ebt                                                   vol
$1601201  2          7.40e6      0.0        0.     0.       0.    5
*                                                jun
$1601301   0.0         0.0      0.0             4
*          diamj       beta    c       m        jun
$1601401   0.04        0.0     1.0     1.0       4
*
***************************** JUNCTION 165 *****************************
* Loop 1 sg downcomer-to-riser connection
*====================================================================
$1650000   dcrisr1   mtpljun
*----------------------------------------------------------------------
$1650001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$1650011 160050003 170010004 0.3694    0.2   0.2    001003  1.0  1.0 1.0
*          inc-frm    inc-to   0         limit
$1650012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
$1651011     0.0          0.0            1
*
*  2nnm     Dhyd       b       c       m          #
$1652011     0.032      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$1650021 160040003 170020004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*          inc-frm    inc-to   0         limit
$1650022 000000000 000000000   0         2
*
*  1nnm    velf         velg            #
$1651021     0.0          0.0            2
*
*  2nnm     Dhyd       b       c       m          #
$1652021     0.032      1.0     2.0     1.0        2
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$1650031 160030003 170030004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*          inc-frm    inc-to   0         limit
$1650032 000000000 000000000   0         3
*
*  1nnm    velf         velg            #
$1651031     0.0          0.0            3
*
*  2nnm     Dhyd       b       c       m          #
$1652031     0.032      1.0     2.0     1.0        3
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$1650041 160020003 170040004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*          inc-frm    inc-to   0         limit
$1650042 000000000 000000000   0         4
*
*  1nnm    velf         velg            #
$1651041     0.0          0.0            4
*
*  2nnm     Dhyd       b       c       m          #
$1652041     0.032      1.0     2.0     1.0        4
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$1650051 160010003 170050004 0.2413    5.0   5.0    001003  1.0  1.0 1.0
*          inc-frm    inc-to   0         limit
$1650052 000000000 000000000   0         5
*
*  1nnm    velf         velg            #
$1651051     0.0          0.0            5
*
*  2nnm     Dhyd       b       c       m          #
$1652051     0.032      1.0     2.0     1.0        5
*
***************************** VOLUME 170 ******************************
* Loop 1 sg riser
*====================================================================
$1700000         riser1          pipe
*--------------------------------------------------------------------------*
*
*hydro   no. volumes
$1700001    5
*
*hydro   vol area    vol
$1700101   0.0         5
*
*hydro   jun area    jun
$1700201   0.0         4
*
*hydro  length       vol
$1700301  0.563        1
$1700302  0.476        4
$1700303  0.374        5
*
*hydro   volume      vol
$1700401   0.04553     1
$1700402   0.03701     4
```

```
$1700403   0.02909      5
*
*hydro   vert angle  vol
$1700601   90.0         5
*
*hydro   delta z     vol
$1700701   0.563        1
$1700702   0.476        4
$1700703   0.374        5
*
*hydro   roughness  hyd diam  vol
$1700801   1.0e-5      0.0376    5
*
*hydro    Kfwd       Krev     jun
$1700901   0.0        0.0        4
*
*hydro   fe         vol
$1701001  00          5
*
*hydro  fvcahs       jun
$1701101 001000         4
*
*hydro  ebt                                                    vol
$1701201  2          7.40e6      0.0        0.     0.       0.    5
*                                              jun
$1701301   0.0         0.0      0.0              4
*         diamj       beta    c       m        jun
$1701401   0.0376      0.0     1.0     1.0       4
*
**************************** VOLUME 172 *****************************
* Loop 1 sg lower steam dome
*============================================================================*
$1720000   lwrdom1    branch
*----------------------------------------------------------------------------*
*         no. juns  vel/flow
$1720001   3         0
*         area                length          volume
$1720101   0.0                 0.630           0.09265
*         azim angle          incl angle      delta z
$1720102     0.                90.0            0.630
*         roughness           hyd dia         pvbfe
$1720103   5.0e-5              0.343           01000
*         ebt
$1720200     2    7.40e6      1.0
*         from      to        area      Kf    Kr    fvcahs
$1721101   170010000 172000000 0.07778   0.24  0.24  101000
$1722101   172010000 175000000 0.1521    0.0   0.0   001000
$1723101   172000000 160000000 0.02639   0.41  0.68  101000
*         velf       velg     veli
$1721201   0.0        0.0        0.
$1722201   0.0        0.0        0.
$1723201   0.0        0.0        0.
*         hyd dia   beta      y-int     slope
$1721110   0.0376    1.00      1.00      1.00
$1722110   0.0       0.00      1.00      1.00
$1723110   0.04      0.00      1.00      1.00
*
**********************************************************************
* End of superseded components
**********************************************************************
*
**************************** VOLUME 170 *****************************
* Loop 1 sg riser
*======================================================================
1700000         riser1          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
```

```
1700001    5
*
*hydro   vol area    vol
1700101   0.0         5
*
*hydro   jun area    jun
1700201   0.0         4
*
*hydro  length       vol
1700301  0.563        1
1700302  0.476        4
1700303  0.374        5
*
*hydro   volume      vol
1700401   0.06039      1
1700402   0.04957      4
1700403   0.03896      5
*
*hydro   vert angle  vol
1700601   90.0        5
*
*hydro   delta z     vol
1700701   0.563        1
1700702   0.476        4
1700703   0.374        5
*
*hydro   roughness  hyd diam  vol
1700801   1.0e-5     0.0378    5
*
*hydro    Kfwd       Krev     jun
1700901   0.0        0.0        4
*
*hydro   fe         vol
1701001  00          5
*
*hydro  fvcahs       jun
1701101 001000        4
*
*hydro  ebt                                                    vol
1701201  0          7189175.    1267214.   2579955. .0625196 0.  1
1701202  0          7185735.    1267115.   2579991. .117796  0.  2
1701203  0          7182753.    1266981.   2580023. .1626384 0.  3
1701204  0          7179954.    1266852.   2580052. .230405 0.   4
1701205  0          7177372.    1266269.   2580080. .0884327 0.  5
*                                                  jun
1701301   -6.85573-4  .189976  0.              1 * 1.544104-4
1701302   -.001454652 .203603  0.              2 * 5.02884-4
1701303   -.002387164 .222943  0.              3 * .00101984
1701304   -.002692253 .210938  0.              4 * .001866472
*         diamj       beta    c       m        jun
1701401   0.0376      0.0     1.0     1.0       4
*
**************************** VOLUME 172 *****************************
* Loop 1 sg lower steam dome
*============================================================================*
1720000   lwrdom1    branch
*----------------------------------------------------------------------------*
*         no. juns  vel/flow
1720001   2         0
*         area                length          volume
1720101   0.0                 0.630           0.09265
*         azim angle          incl angle      delta z
1720102     0.                90.0            0.630
*         roughness           hyd dia         pvbfe
1720103   5.0e-5              0.343           01000
*         ebt
1720200     0    7175318.    1243621. 2580074. .680619
*         from      to        area      Kf    Kr    fvcahs
```

```
1721101   170010000 172000000 0.10417   0.10  0.16  101000
1722101   172010000 175000000 0.1521    0.0   0.0   001000
*         velf       velg     veli
1721201   -.00910946 .658514    0. * .001922815
1722201   -.706497   .04342745  0. * .1671202
*         hyd dia   beta      y-int     slope
1721110   0.0376    1.00      1.00      1.00
1722110   0.0       0.00      1.00      1.00
*
**************************** VOLUME 175 ******************************
* Loop 1 sg upper portion of steam dome
*=====================================================================
1750000        uprdom1            pipe
*-----------------------------------------------------------------------------*
*
*hydro   no. volumes
1750001    2
*
*hydro   vol area    vol
1750101   0.1521       2
*
*hydro   jun area    jun
1750201   0.0          1
*
*hydro  length       vol
1750301  0.470         2
*
*hydro   volume      vol
1750401   0.0          2
*
*hydro   vert angle  vol
1750601   90.0         2
*
*hydro   delta z     vol
1750701   0.470        2
*
*hydro   roughness  hyd diam  vol
1750801   1.0e-5      0.440     2
*
*hydro    Kfwd       Krev     jun
1750901   0.0        0.0       1
*
*hydro   fe         vol
1751001  00           2
*
*hydro  fvcahs       jun
1751101 001000         1
*
*hydro  ebt                                                          vol
1751201  0          7174418.    1266640.   2580099. .999978 0.   1
1751202  0          7174244.    1266631.   2580109. .999946 0.   2
*                                            jun
1751301   -.1469628   .02947904 0.             1 * .1674956
*         diamj       beta    c       m        jun
1751401   0.440       0.0     1.0     1.0       1
*
**************************** VOLUME 180 ******************************
* Steam line 1
*=====================================================================
1800000   stmlin1    branch
*-----------------------------------------------------------------------------
*         no. juns  vel/flow
1800001   1         0
*         area                length          volume
1800101   0.0003142           4.74            0.0
*         azim angle          incl angle      delta z
1800102   0.0                   0.0            0.0
*         roughness           hyd dia         pvbfe
```

```
1800103   5.0e-5              0.020           00000
*         ebt
1800200     0    7163829.    1266465. 2580322. .999949
*         from      to        area       Kf     Kr    fvcahs
1801101   175020004 180000000 0.0003142  0.0    0.0   001101
*         velf       velg     veli
1801201   .52291     14.22048   0. * .167789
*         hyd dia   beta      y-int     slope
1801110   0.020     0.00      1.00      1.00
*
**************************** JUNCTION 181 ****************************
* Steam Line 1 Relief Valve
*==================================================================$
1810000           relief1        valve
*-------------------------------------------------------------------
*
*hydro    from          to            area      kf    kr     vcahs
1810101   180010003     182000000     0.0003142 0.0   0.0    00102
*
*         hyd dia   beta      y-int     slope
1810110   0.020     0.00      1.00      1.00
*
*         ic     velf       velg     veli
1810201   0      0.         0.       0. * 0.
*
1810300   trpvlv
1810301    1181
*
**************************** VOLUME  182 ******************************
* Atmospheric boundary condition for steam relief
*====================================================================*
1820000   atmos1   tmdpvol
*--------------------------------------------------------------------*
*         area                length          volume
1820101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
1820102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
1820103   0.00000             0.0000          00010
*         ebt       trip          search var
1820200   003       0
*         indep var
1820201   0.00     1.013e5    300.0
*
**************************** JUNCTION 185 ****************************
* Steam Line 1 Isolation Valve
*==================================================================$
1850000               isolv1       valve
*-------------------------------------------------------------------
*
*hydro    from          to            area      kf    kr     vcahs
1850101   180010000     700010003     0.0003142 0.0   0.0    01101
*
*         hyd dia   beta      y-int     slope
1850110   0.020     0.00      1.00      1.00
*
*         ic     velf       velg     veli
1850201   0      .569663    14.24324 0. * .167748
*
1850300   mtrvlv
*
*         open  close  rate     ic
1850301    185   184   0.066667 1.      * 15 s closing time
*
*#####################################################################
*                            LOOP 2                                  $
*                       PRIMARY COOLANT SYSTEM                       $
*#####################################################################
```

```
*
***************************** VOLUME 201 ******************************
* Loop 2 hot leg
*======================================================================
2010000          hotleg2          pipe
*---------------------------------------------------------------------*
*
*hydro   no. volumes
2010001   7
*
*hydro   vol area    vol
2010101   0.004536     7
*
*hydro   jun area    jun
2010201   0.004536     6
*
*hydro  length       vol
2010301  0.6683        3
2010302  0.420         4
2010303  0.567         7
*
*hydro   volume      vol
2010401   0.0          7
*
*hydro   horiz ang   vol
2010501 -45.0          7
*
*hydro   vert angle  vol
2010601   0.0          4
2010602  42.22         5
2010603  90.0          7
*
*hydro   delta z     vol
2010701   0.0          4
2010702   0.381        5
2010703   0.567        7
*
*hydro   roughness  hyd diam  vol
2010801   5.00e-5     0.076     7
*
*hydro    Kfwd       Krev     jun
2010901   0.0        0.0       3
2010902   0.25       0.25      4
2010903   0.0        0.0       6
*
*hydro   fe         vol
2011001  00           7
*
*hydro  fvcahs       jun
2011101 001000         6
*
*hydro  ebt                                                   vol
2011201  0          16891470.   1404572.   2412312. 0.     0.    1
2011202  0          16891440.   1404438.   2412312. 0.     0.    2
2011203  0          16891408.   1404304.   2412313. 0.     0.    3
2011204  0          16891384.   1404219.   2412314. 0.     0.    4
2011205  0          16890020.   1404105.   2412349. 0.     0.    5
2011206  0          16886770.   1403992.   2412433. 0.     0.    6
2011207  0          16882890.   1403878.   2412532. 0.     0.    7
*                                              jun
2011301   .731617     .731617  0.              1 * 2.3
2011302   .731557     .731557  0.              2 * 2.3
2011303   .731496     .731496  0.              3 * 2.3
2011304   .731457     .731457  0.              4 * 2.3
2011305   .731408     .731408  0.              5 * 2.3
2011306   .73136      .73136   0.              6 * 2.3
*
*         diamj       beta    c       m        jun
2011401   0.076       0.0     1.0     1.0       6
*
***************************** VOLUME 210 ******************************
* Steam generator 2 inlet transition region
*======================================================================
2100000   sginle2       branch
*---------------------------------------------------------------------*
*         no. juns  vel/flow
2100001   2         0
*         area                length          volume
2100101   0.0                 0.210           0.00129
*         azim angle          incl angle      delta z
2100102   0.0                 90.0            0.210
*         roughness           hyd dia         pvbfe
2100103   5.00e-5             0.0             00000
*         ebt
2100200     0    16880318.  1403839. 2412599. 0.
*         from      to        area      Kf    Kr    fvcahs
2101101   201010000 210000000 0.004536 0.0    0.0   001000
2102101   210010000 215000000 0.004301 0.045  0.023 001000
*         velf       velg     veli
2101201   .731314    .731314    0.   * 2.3
2102201   .771257    .771257    0.   * 2.3
*         hyd dia   beta      y-int     slope
2101110   0.076     0.00      1.00      1.00
2102110   0.074     0.00      1.00      1.00
*
***************************** VOLUME 215 ******************************
* Steam generator 2 hot collector
*======================================================================
2150000          sg1hotc          pipe
*---------------------------------------------------------------------*
*
*hydro   no. volumes
2150001   5
*
*hydro   vol area    vol
2150101   0.0          1
2150102   0.003632     4
2150103   0.0          5
*
*hydro   jun area    jun
2150201   0.0          4
*
*hydro  length       vol
2150301  0.508         1
2150302  0.476         4
2150303  0.429         5
*
*hydro   volume      vol
2150401   0.001849     1
2150402   0.0          4
2150403   0.001588     5
*
*hydro   horiz ang   vol
2150501   0.0          5
*
*hydro   vert angle  vol
2150601  90.0          5
*
*hydro   delta z     vol
2150701  0.508         1
2150702  0.476         4
2150703  0.429         5
*
*hydro   roughness  hyd diam  vol
2150801   5.00e-5     0.068     5
*
```

```
*hydro    Kfwd       Krev     jun
2150901   0.0        0.0        4
*
*hydro   fe         vol
2151001  00           5
*
*hydro  fvcahs       jun
2151101 001000         4
*
*hydro  ebt                                                    vol
2151201  0          16877684.   1402170.   2412666. 0.     0.    1
2151202  0          16874404.   1400504.   2412751. 0.     0.    2
2151203  0          16871222.   1398459.   2412833. 0.     0.    3
2151204  0          16868020.   1395800.   2412915. 0.     0.    4
2151205  0          16864946.   1.392+6    2412994. 0.     0.    5
*                                              jun
2151301   .73562      .73562   0.              1 * 1.854402
2151302   .55248      .55248   0.              2 * 1.39415
2151303   .363967     .363967  0.              3 * .919592
2151304   .170144     .170144  0.              4 * .4305744
*
*         diamj       beta    c       m        jun
2151401   0.068       0.0     1.0     1.0       4
*
**************************** JUNCTION 216 *****************************
* junctions between the hot collector and the sg tubes
*=======================================================================
2160000        hcjuns2         mtpljun
*-----------------------------------------------------------------------
2160001    5        0
*
*  0nnm  from      to        area     kfor  krev  efvcahs  sub  2ph
2160011 215050004 225000000 0.0007964 0.005 0.002 0001002  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
2160012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
2161011     .774177      .774177        1 * .4305744
*
*  2nnm     Dhyd       b       c       m          #
2162011     0.013      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev  efvcahs  sub  2ph
2160021 215040004 224000000 0.0009291 0.005 0.002 0001002  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
2160022    -10000  -1000000   0         5
*
*  1nnm    velf         velg            #
2161021     .755397      .755397        2 * .489017
2161031     .734242      .734242        3 * .474558
2161041     .712996      .712996        4 * .460253
2161051     .690996      .690996        5 * .445598
*
*  2nnm     Dhyd       b       c       m          #
2162021     0.013      1.0     2.0     1.0        5
*
***************************** VOLUME 221 ******************************
* Steam generator 2 tubes row 1 (7 tubes)
*=======================================================================
2210000          sg2tub1          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
2210001   10
*
*hydro   vol area    vol
2210101   0.0009291   10
*
```

```
*hydro   jun area    jun
2210201   0.0          9
*
*hydro  length       vol
2210301  1.0656       10
*
*hydro   volume      vol
2210401   0.0         10
*
*hydro   horiz ang   vol
2210501   0.0         10
*
*hydro   vert angle  vol
2210601   0.0          1
2210602  -0.343        9
2210603   0.0         10
*
*hydro   delta z     vol
2210701  0.0           1
2210702 -0.006375      9
2210703  0.0          10
*
*hydro   roughness  hyd diam  vol
2210801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
2210901   0.047      0.047      9
*
*hydro   fe         vol
2211001  00          10
*
*hydro  fvcahs       jun
2211101 001000         9
*
*hydro  ebt                                                    vol
2211201  0          16877310.   1346880.   2412676. 0.     0.   1
2211202  0          16876938.   1312264.   2412686. 0.     0.   2
2211203  0          16876596.   1290411.   2412694. 0.     0.   3
2211204  0          16876258.   1276592.   2412703. 0.     0.   4
2211205  0          16875920.   1267738.   2412712. 0.     0.   5
2211206  0          16875584.   1261983.   2412720. 0.     0.   6
2211207  0          16875250.   1258183.   2412729. 0.     0.   7
2211208  0          16874916.   1255630.   2412738. 0.     0.   8
2211209  0          16874582.   1253885.   2412746. 0.     0.   9
2211210  0          16874224.   1252668.   2412755. 0.     0.   10
*                                              jun
2211301   .66942      .66942   0.              1 * .445598
2211302   .657102     .657102  0.              2 * .445598
2211303   .649846     .649846  0.              3 * .445598
2211304   .645352     .645352  0.              4 * .445598
2211305   .642559     .642559  0.              5 * .445598
2211306   .640779     .640779  0.              6 * .445598
2211307   .639617     .639617  0.              7 * .445598
2211308   .638844     .638844  0.              8 * .445598
2211309   .638317     .638317  0.              9 * .445598
*
*         diamj       beta    c       m        jun
2211401   0.013       0.0     1.0     1.0       9
*
***************************** VOLUME 222 ******************************
* Steam generator 2 tubes row 2 (7 tubes)
*=======================================================================
2220000          sg2tub2          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
2220001   10
*
```

```
*hydro   vol area    vol
2220101   0.0009291   10
*
*hydro   jun area    jun
2220201   0.0          9
*
*hydro  length       vol
2220301  1.0656       10
*
*hydro   volume      vol
2220401   0.0         10
*
*hydro   horiz ang   vol
2220501   0.0         10
*
*hydro   vert angle  vol
2220601   0.0          1
2220602  -0.343        9
2220603   0.0         10
*
*hydro   delta z     vol
2220701  0.0           1
2220702 -0.006375      9
2220703  0.0          10
*
*hydro   roughness  hyd diam  vol
2220801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
2220901   0.047      0.047      9
*
*hydro   fe         vol
2221001  00          10
*
*hydro  fvcahs       jun
2221101 001000         9
*
*hydro  ebt                                                      vol
2221201  0          1.6874+7    1346355.   2412761. 0.     0.   1
2221202  0          16873610.   1312239.   2412771. 0.     0.   2
2221203  0          16873242.   1290567.   2412781. 0.     0.   3
2221204  0          16872878.   1276781.   2412790. 0.     0.   4
2221205  0          16872516.   1267897.   2412799. 0.     0.   5
2221206  0          16872156.   1262091.   2412809. 0.     0.   6
2221207  0          16871796.   1258238.   2412818. 0.     0.   7
2221208  0          16871438.   1255639.   2412827. 0.     0.   8
2221209  0          16871078.   1253853.   2412836. 0.     0.   9
2221210  0          16870696.   1252605.   2412846. 0.     0.   10
*                                              jun
2221301   .691235     .691235  0.              1 * .460253
2221302   .678706     .678706  0.              2 * .460253
2221303   .671274     .671274  0.              3 * .460253
2221304   .666641     .666641  0.              4 * .460253
2221305   .663745     .663745  0.              5 * .460253
2221306   .661889     .661889  0.              6 * .460253
2221307   .660673     .660673  0.              7 * .460253
2221308   .659859     .659859  0.              8 * .460253
2221309   .659303     .659303  0.              9 * .4602525
*
*         diamj       beta    c       m        jun
2221401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 223 ******************************
* Steam generator 2 tubes row 3 (7 tubes)
*=====================================================================
2230000          sg2tub3          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
2230001   10
*
*hydro   vol area    vol
2230101   0.0009291   10
*
*hydro   jun area    jun
2230201   0.0          9
*
*hydro  length       vol
2230301  1.0656       10
*
*hydro   volume      vol
2230401   0.0         10
*
*hydro   horiz ang   vol
2230501   0.0         10
*
*hydro   vert angle  vol
2230601   0.0          1
2230602  -0.343        9
2230603   0.0         10
*
*hydro   delta z     vol
2230701  0.0           1
2230702 -0.006375      9
2230703  0.0          10
*
*hydro   roughness  hyd diam  vol
2230801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
2230901   0.047      0.047      9
*
*hydro   fe         vol
2231001  00          10
*
*hydro  fvcahs       jun
2231101 001000         9
*
*hydro  ebt                                                      vol
2231201  0          16870800.   1345561.   2412844. 0.     0.   1
2231202  0          16870378.   1312030.   2412855. 0.     0.   2
2231203  0          1.687+7     1290605.   2412865. 0.     0.   3
2231204  0          16869594.   1276898.   2412875. 0.     0.   4
2231205  0          16869208.   1268016.   2412885. 0.     0.   5
2231206  0          16868822.   1262181.   2412895. 0.     0.   6
2231207  0          16868438.   1258291.   2412904. 0.     0.   7
2231208  0          16868054.   1255654.   2412914. 0.     0.   8
2231209  0          16867670.   1253836.   2412924. 0.     0.   9
2231210  0          16867262.   1252560.   2412935. 0.     0.   10
*                                              jun
2231301   .712408     .712408  0.              1 * .474558
2231302   .69973      .69973   0.              2 * .474558
2231303   .692155     .692155  0.              3 * .474558
2231304   .687404     .687404  0.              4 * .474558
2231305   .684418     .684418  0.              5 * .474558
2231306   .682495     .682495  0.              6 * .474558
2231307   .681228     .681228  0.              7 * .474558
2231308   .680377     .680377  0.              8 * .474558
2231309   .679793     .679793  0.              9 * .474558
*
*         diamj       beta    c       m        jun
2231401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 224 ******************************
* Steam generator 2 tubes row 4 (7 tubes)
*=====================================================================
```

```
2240000          sg2tub4          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
2240001   10
*
*hydro   vol area    vol
2240101   0.0009291   10
*
*hydro   jun area    jun
2240201   0.0          9
*
*hydro  length       vol
2240301  1.0656       10
*
*hydro   volume      vol
2240401   0.0         10
*
*hydro   horiz ang   vol
2240501   0.0         10
*
*hydro   vert angle  vol
2240601   0.0          1
2240602  -0.343        9
2240603   0.0         10
*
*hydro   delta z     vol
2240701  0.0          1
2240702 -0.006375      9
2240703  0.0         10
*
*hydro   roughness  hyd diam  vol
2240801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
2240901   0.047      0.047      9
*
*hydro   fe         vol
2241001  00         10
*
*hydro  fvcahs       jun
2241101 001000         9
*
*hydro  ebt                                                        vol
2241201  0          16867574.   1344357.   2412927. 0.     0.   1
2241202  0          16867124.   1311550.   2412938. 0.     0.   2
2241203  0          16866704.   1290468.   2412949. 0.     0.   3
2241204  0          16866288.   1276903.   2412960. 0.     0.   4
2241205  0          16865874.   1268064.   2412970. 0.     0.   5
2241206  0          16865464.   1262227.   2412981. 0.     0.   6
2241207  0          16865052.   1258316.   2412992. 0.     0.   7
2241208  0          16864642.   1255654.   2.413+6  0.     0.   8
2241209  0          16864232.   1253810.   2413013. 0.     0.   9
2241210  0          16863800.   1252512.   2413024. 0.     0.   10
*                                             jun
2241301   .733625     .733625  0.              1 * .489017
2241302   .720875     .720875  0.              2 * .489017
2241303   .713197     .713197  0.              3 * .489017
2241304   .708353     .708353  0.              4 * .489017
2241305   .705291     .705291  0.              5 * .489017
2241306   .703308     .703308  0.              6 * .489017
2241307   .701995     .701995  0.              7 * .489017
2241308   .70111      .70111   0.              8 * .489017
2241309   .7005       .7005    0.              9 * .489017
*
*         diamj       beta    c       m       jun
2241401   0.013       0.0     1.0     1.0      9
*
```

```
***************************** VOLUME 225 *****************************
* Steam generator tubes 2 row 5 (6 tubes)
*=====================================================================
2250000          sg2tub5          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
2250001   10
*
*hydro   vol area    vol
2250101   0.0007964   10
*
*hydro   jun area    jun
2250201   0.0          9
*
*hydro  length       vol
2250301  1.0656       10
*
*hydro   volume      vol
2250401   0.0         10
*
*hydro   horiz ang   vol
2250501   0.0         10
*
*hydro   vert angle  vol
2250601   0.0          1
2250602  -0.343        9
2250603   0.0         10
*
*hydro   delta z     vol
2250701  0.0          1
2250702 -0.006375      9
2250703  0.0         10
*
*hydro   roughness  hyd diam  vol
2250801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
2250901   0.047      0.047      9
*
*hydro   fe         vol
2251001  00         10
*
*hydro  fvcahs       jun
2251101 001000         9
*
*hydro  ebt                                                        vol
2251201  0          16864478.   1342368.   2413006. 0.     0.   1
2251202  0          1.6864+7    1310534.   2413019. 0.     0.   2
2251203  0          16863558.   1289975.   2413030. 0.     0.   3
2251204  0          16863118.   1276672.   2413042. 0.     0.   4
2251205  0          16862680.   1267959.   2413053. 0.     0.   5
2251206  0          16862242.   1262175.   2413064. 0.     0.   6
2251207  0          16861808.   1258280.   2413075. 0.     0.   7
2251208  0          16861372.   1255615.   2413086. 0.     0.   8
2251209  0          16860938.   1253761.   2413098. 0.     0.   9
2251210  0          16860482.   1252449.   2413109. 0.     0.   10
*                                             jun
2251301   .752753     .752753  0.              1 * .4305744
2251302   .740101     .740101  0.              2 * .4305744
2251303   .732416     .732416  0.              3 * .4305744
2251304   .727541     .727541  0.              4 * .4305744
2251305   .724441     .724441  0.              5 * .4305744
2251306   .722423     .722423  0.              6 * .430574
2251307   .72108      .72108   0.              7 * .430574
2251308   .72017      .72017   0.              8 * .430574
2251309   .71954      .71954   0.              9 * .430574
*
```

```
*         diamj       beta    c       m        jun
2251401   0.013       0.0     1.0     1.0       9
*
**************************** JUNCTION 228 *****************************
* junctions between the sg tubes and the cold collector
*=======================================================================
2280000        ccjuns2        mtpljun
*-----------------------------------------------------------------------
2280001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
2280011 225010000 229050003 0.0007964 0.005  0.002  001001  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
2280012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
2281011     .719096      .719096        1 * .430574
*
*  2nnm     Dhyd       b       c       m          #
2282011     0.013      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
2280021 224010000 229040003 0.0009291 0.005  0.002  001001  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
2280022  -1000000    -10000   0         5
*
*  1nnm    velf         velg            #
2281021     .700072      .700072        2 * .489017
2281031     .679385      .679385        3 * .474558
2281041     .658916      .658916        4 * .4602525
2281051     .637952      .637952        5 * .445598
*
*  2nnm     Dhyd       b       c       m          #
2282021     0.013      1.0     2.0     1.0        5
*
**************************** VOLUME 229 ******************************
* Steam generator 2 cold collector
*=======================================================================
2290000          sg2cldc          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
2290001   6
*
*hydro   vol area    vol
2290101   0.0         1
2290102   0.003632    5
2290103   0.0         6
*
*hydro   jun area    jun
2290201   0.0         5
*
*hydro  length       vol
2290301  0.508        1
2290302  0.476        4
2290303  0.429        5
2290304  0.051        6
*
*hydro   volume      vol
2290401   0.001883    1
2290402   0.0         5
2290403   0.0002164   6
*
*hydro   horiz ang   vol
2290501   0.0         6
*
*hydro   vert angle  vol
2290601  90.0         6
```

```
*
*hydro   delta z     vol
2290701  0.508        1
2290702  0.476        4
2290703  0.429        5
2290704  0.051        6
*
*hydro   roughness  hyd diam  vol
2290801   5.00e-5     0.068     5
2290802   5.00e-5     0.074     6
*
*hydro    Kfwd       Krev     jun
2290901   0.0        0.0       4
2290902   0.016      0.032     5
*
*hydro   fe         vol
2291001  00          6
*
*hydro  fvcahs      jun
2291101 001000        5
*
*hydro  ebt                                                    vol
2291201  0          16874190.   1252436.   2412756. 0.     0.   1
2291202  0          16870660.   1252420.   2412847. 0.     0.   2
2291203  0          16867224.   1252403.   2412936. 0.     0.   3
2291204  0          16863760.   1252388.   2413025. 0.     0.   4
2291205  0          16860440.   1252376.   2413111. 0.     0.   5
2291206  0          16858672.   1263399.   2413156. 0.     0.   6
*                                              jun
2291301   -.679074    -.679074 0.              1 * -1.854402
2291302   -.510529    -.510529 0.              2 * -1.39415
2291303   -.336748    -.336748  0.             3 * -.919592
2291304   -.157673    -.157673  0.             4 * -.430574
2291305   8.0974-11   8.11051-11  0.           5 * 2.21124-10
*
*         diamj       beta    c       m        jun
2291401   0.068       0.0     1.0     1.0       5
*
**************************** VOLUME 230 ******************************
* Steam generator 2 inlet transition region
*=======================================================================
2300000   sgoutlt2      branch
*-------------------------------------------------------------------------------*
*         no. juns  vel/flow
2300001   2         0
*         area                length          volume
2300101   0.0                 0.159           0.001069
*         azim angle          incl angle      delta z
2300102   0.0                -90.0           -0.159
*         roughness           hyd dia         pvbfe
2300103   5.00e-5             0.0             00000
*         ebt
2300200     0    16876738.  1252436. 2412691. 0.
*         from      to        area      Kf    Kr    fvcahs
2301101   229000000 230000000 0.004301 0.023  0.045 001000
2302101   230010000 235000000 0.004536 0.0    0.0   001000
*         velf       velg     veli
2301201   .711244    .711244    0. * 2.3
2302201   .674394    .674394    0. * 2.3
*         hyd dia   beta      y-int     slope
2301110   0.074     0.00      1.00      1.00
2302110   0.076     0.00      1.00      1.00
*
**************************** VOLUME 235 ******************************
* Loop 2 pump suction piping of cold leg
*=======================================================================
2350000          pmpsct2          pipe
*-------------------------------------------------------------------------------*
```

```
*
*hydro   no. volumes
2350001   14
*
*hydro   vol area    vol
2350101   0.004536    10
2350102   0.0         11
2350103   0.004536    14
*
*hydro   jun area    jun
2350201   0.004536    13
*
*hydro  length       vol
2350301  0.828         5
2350302  1.042         7
2350303  1.136         8
2350304  0.7495       10
2350305  0.749        14
*
*hydro   volume      vol
2350401   0.0         10
2350402   0.006914    11
2350403   0.0         14
*
*hydro   horiz ang   vol
2350501  90.0          8
2350502   5.0         14
*
*hydro   vert angle  vol
2350601 -90.0          8
2350602   0.0         10
2350603  90.0         14
*
*hydro   delta z     vol
2350701 -0.828         5
2350702 -0.7425        7
2350703 -0.950         8
2350704  0.0          10
2350705  0.653        11
2350706  0.749        14
*
*hydro   roughness  hyd diam  vol
2350801   5.00e-5     0.076    14
*
*hydro    Kfwd       Krev     jun
2350901   0.0        0.0        4
2350902   0.13       0.13       5
2350903   0.0        0.0        6
2350904   0.13       0.13       7
2350905   0.25       0.25       8
2350906   0.0        0.0        9
2350907   0.25       0.25      10
2350908   0.0        0.0       13
*
*hydro   fe         vol
2351001  00          14
*
*hydro  fvcahs       jun
2351101 001000        13
*
*hydro  ebt                                                     vol
2351201  0          16880264.   1252288.   2412600. 0.     0.   1
2351202  0          16886336.   1252140.   2412444. 0.     0.   2
2351203  0          16892406.   1251993.   2412288. 0.     0.   3
2351204  0          16898478.   1251845.   2412131. 0.     0.   4
2351205  0          16904550.   1251698.   2411975. 0.     0.   5
2351206  0          16910282.   1251512.   2411828. 0.     0.   6
2351207  0          16915714.   1251326.   2411683. 0.     0.   7
```

```
2351208  0          16921890.   1251124.   2411500. 0.     0.   8
2351209  0          16925312.   1250990.   2411399. 0.     0.   9
2351210  0          16925280.   1250857.   2411400. 0.     0.   10
2351211  0          16922938.   1250652.   2411469. 0.     0.   11
2351212  0          16917614.   1250519.   2411627. 0.     0.   12
2351213  0          16912054.   1250385.   2411782. 0.     0.   13
2351214  0          16906494.   1250251.   2411925. 0.     0.   14
*                                                    jun
2351301   .674344     .674344  0.             1 * 2.3
2351302   .674292     .674292  0.             2 * 2.3
2351303   .67424      .67424   0.             3 * 2.3
2351304   .674188     .674188  0.             4 * 2.3
2351305   .674136     .674136  0.             5 * 2.3
2351306   .674073     .674073  0.             6 * 2.3
2351307   .67401      .67401   0.             7 * 2.3
2351308   .67394      .67394   0.             8 * 2.3
2351309   .673895     .673895  0.             9 * 2.3
2351310   .673853     .673853  0.             10 * 2.3
2351311   .67379      .67379   0.             11 * 2.3
2351312   .673753     .673753  0.             12 * 2.3
2351313   .673715     .673715  0.             13 * 2.3
*
*         diamj       beta    c       m        jun
2351401   0.076       0.0     1.0     1.0      13
 2
***********************************  VOLUME 240  *******************************
* Loop 2 primary coolant pump
*========================================================================
2400000   mcp2        pump
*-------------------------------------------------------------------------------*
*         area           length          volume
2400101   0.0            0.746           0.010
*         azim angle     incl angle      delta z   pvbfe
2400102   0.0            30.0            0.370     00000
*         from      jun area  Kf    Kr    efvcahs
2400108   235010000 0.004536  0.0   0.0   0001000
*         to        jun area  Kf    Kr    efvcahs
2400109   242000000 0.004536  0.0   0.0   0001000
*         hyd dia   beta      y-int     slope
2400110   0.076     0.00      1.00      1.00
2400111   0.076     0.00      1.00      1.00
*         ebt
2400200     0    16907300.  1243947. 2411905. 0.
*         vel/flow  liquid    vapor     int-face
2400201   0         .673678   .673678   0. * 2.3
2400202   0         .671697   .671697   0. * 2.3
*         tabdat-i  2ph-i  2phdiff-i torque-i  pvel-i  trip  rev-i
2400301   -2        -1     -3        -1        0       1240  1
*         rated vel  in/rated vel  rated flow  rated head
2400302   314.2      .1243633      0.022       100.
*         rated torq   mom-iner  rated dens  rated m-torq
2400303   57.2         3.7-2     750.0       0.00
*         coeff-tf2  coeff-tf0  coeff-tf1  coeff-tf3
2400304   0.57       0.57       0.0       0.0
*
*hydro        trip no.          parameter no.
2406100         240           cntrlvar  240
*
*hydro        indp var          speed (rad/s)
2406101        -1.0             314.2
2406102         0.0                0.
2406103       500.0              500.
*
***************************** VOLUME 242 *****************************
* Piping from pump discharge to isolation valve
*=================================================================$
*hydro            component name      component type
2420000              pmp2out            sngvol
```

```
*---------------------------------------------------------------------$
*hydro           area              length              volume
2420101          0.004536          0.880               0.0
*
*hydro         horz angle          vert angle           delta z
2420102         170.0                0.0                  0.0
*
*hydro          roughness           hyd diam              fe
2420103          0.00005            0.076                 00
*
*hydro  ebt  pressure     tempe
2420200   0    16910562.  1243701. 2411821. 0.
*
**************************** JUNCTION 243 ****************************
* Cold leg isolation valve
*====================================================================$
2430000               cl2vlv        valve
*---------------------------------------------------------------------
*
*hydro    from          to            area     kf    kr     vcahs
2430101   242010000     245000000    0.004536 0.0    0.0    00100
*
2430201   0        .671615 .671615 0. * 2.3
*
2430300   mtrvlv
*
*         open  close  rate  ic
2430301   242   243    0.1   1.
*
**************************** VOLUME 245 ******************************
* Loop 2 reactor vessel inlet section of cold leg
*=====================================================================
2450000          cldleg2          pipe
*-----------------------------------------------------------------------------*
*
*hydro   no. volumes
2450001   4
*
*hydro   vol area    vol
2450101   0.004536     4
*
*hydro   jun area    jun
2450201   0.004536     3
*
*hydro  length       vol
2450301  0.782         3
2450302  0.741         4
*
*hydro   volume      vol
2450401   0.0          4
*
*hydro   horiz ang   vol
2450501   170.0        3
2450502   125.0        4
*
*hydro   vert angle  vol
2450601   0.0          4
*
*hydro   delta z     vol
2450701   0.0          4
*
*hydro   roughness  hyd diam  vol
2450801   5.00e-5     0.076     4
*
*hydro    Kfwd       Krev     jun
2450901   0.0        0.0       2
2450902   0.16       0.16      3
*
```

```
*hydro   fe         vol
2451001  00           4
*
*hydro  fvcahs       jun
2451101 001000         3
*
*hydro  ebt                                                     vol
2451201  0          16910528.   1243562.   2411822. 0.     0.    1
2451202  0          16910496.   1243424.   2411822. 0.     0.    2
2451203  0          16910462.   1243154.   2411823. 0.     0.    3
2451204  0          16910402.   1243154.   2411825. 0.     0.    4
*                                                jun
2451301   .671571     .671571  0.                  1 * 2.3
2451302   .671527     .671527  0.                  2 * 2.3
2451303   .67144      .67144   0.                  3 * 2.3
*
*         diamj       beta    c       m        jun
2451401   0.076       0.0     1.0     1.0       3
*
*####################################################################
*                            LOOP 2                                  $
*                     SECONDARY COOLANT SYSTEM                       $
*####################################################################
**************************** VOLUME 250 *****************************
* Loop 2 Main Feedwater source
*====================================================================
2500000   mfw2src   tmdpvol
*-------------------------------------------------------------------*
*         area                length          volume
2500101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
2500102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
2500103   0.00000             0.0000          00010
*         ebt       trip          search var
2500200   003       0
*         indep var
2500201   0.00     10.0e6     443.15
*
**************************** JUNCTION 251 ****************************
* Loop 2 main feedwater flow
*====================================================================
2510000   mfw2      tmdpjun
*
*         From      To        Area
2510101   250010000 259000000 0.0009079
*
*        vel/Kg     trip      var req.  # var req
2510200   1         251                              * trancalc
*
*         Time    kg/s      kg/s      m/s
*2510201    0.0    0.1666    0.        0.              * trancalc
2510201    0.0    0.0       0.        0.             * trancalc
2510202    8.0    0.0       0.        0.             * trancalc
*
**************************** VOLUME 255 *****************************
* Loop 2 Auxiliary Feedwater source
*====================================================================
2550000   afw2src  tmdpvol
*-------------------------------------------------------------------*
*         area                length          volume
2550101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
2550102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
2550103   0.00000             0.0000          00010
*         ebt       trip          search var
2550200   003       0
```

```
*         indep var
2550201   0.00     16.0e6     443.15
*
**************************** JUNCTION 256 *****************************
* Loop 2 auxiliary feedwater flow
*=====================================================================
2560000   afw2      tmdpjun
*
*         From      To        Area
2560101   255010000 259000000 0.0009079
*
*        vel/Kg     trip      var req.  # var req
2560200   1         256
*
*         Time    kg/s      kg/s      m/s
2560201   -1.     0.0       0.        0.
2560202    0.0    0.0       0.        0.
*
**************************** VOLUME 259 ******************************
* Loop 2 Feedwater ring
*=====================================================================
2590000   fwring2    branch
*------------------------------------------------------------------------------
*         no. juns  vel/flow
2590001   1         0
*         area                length          volume
2590101   0.0009079           1.062           0.0
*         azim angle          incl angle      delta z
2590102   0.0                   0.0            0.000
*         roughness           hyd dia         pvbfe
2590103   5.0e-5              0.034           00000
*         ebt
2590200     0    7175361.   1084606. 2580093. .463851
*         from      to        area      Kf    Kr    fvcahs
2591101   259010000 272010003 0.009651 0.0    0.0   001000
*         velf       velg     veli
2591201   .0484272   -.1360606  0.   * .166634
*         hyd dia   beta      y-int     slope
2591110   0.008     0.00      1.00      1.00
*
**********************************************************************
* These components have been superseded.  They are being left in the
* input deck for possible future use.
**********************************************************************
*
**************************** VOLUME 260 ******************************
* Loop 2 sg downcomer
*=====================================================================
$2600000             dc2           annulus
*-----------------------------------------------------------------------------*
*
*hydro   no. volumes
$2600001    5
*
*hydro   vol area    vol
$2600101   0.0         5
*
*hydro   jun area    jun
$2600201   0.0         4
*
*hydro  length       vol
$2600301  0.374        1
$2600302  0.476        4
$2600303  0.563        5
*
*hydro   volume      vol
$2600401   0.00987     1
$2600402   0.01256     4
```

```
$2600403   0.01486      5
*
*hydro   vert angle  vol
$2600601  -90.0         5
*
*hydro   delta z     vol
$2600701  -0.374        1
$2600702  -0.476        4
$2600703  -0.563        5
*
*hydro   roughness  hyd diam  vol
$2600801   1.0e-5      0.04      5
*
*hydro    Kfwd       Krev     jun
$2600901   0.0        0.0       4
*
*hydro   fe         vol
$2601001  00          5
*
*hydro  fvcahs       jun
$2601101 001000         4
*
*hydro  ebt                                                    vol
$2601201  2          7.40e6      0.0        0.     0.       0.    5
*                                                   jun
$2601301   0.0        0.0      0.0            4
*          diamj       beta    c       m        jun
$2601401   0.04       0.0     1.0     1.0       4
*
**************************** JUNCTION 265 ****************************
* Loop 2 sg downcomer-to-riser connection
*====================================================================
$2650000   dcrisr2   mtpljun
*--------------------------------------------------------------------
$2650001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$2650011 260050003 270010004 0.3694    0.2   0.2    001003  1.0  1.0 1.0
*          inc-frm    inc-to   0         limit
$2650012 000000000 000000000   0         1
*
*  1nnm    velf        velg            #
$2651011     0.0         0.0           1
*
*  2nnm     Dhyd       b       c       m          #
$2652011     0.032      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$2650021 260040003 270020004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*          inc-frm    inc-to   0         limit
$2650022 000000000 000000000   0         2
*
*  1nnm    velf        velg            #
$2651021     0.0         0.0           2
*
*  2nnm     Dhyd       b       c       m          #
$2652021     0.032      1.0     2.0     1.0        2
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$2650031 260030003 270030004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*          inc-frm    inc-to   0         limit
$2650032 000000000 000000000   0         3
*
*  1nnm    velf        velg            #
$2651031     0.0         0.0           3
*
*  2nnm     Dhyd       b       c       m          #
$2652031     0.032      1.0     2.0     1.0        3
```

```
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$2650041 260020003 270040004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$2650042 000000000 000000000   0         4
*
*  1nnm    velf         velg            #
$2651041     0.0          0.0            4
*
*  2nnm     Dhyd       b       c       m          #
$2652041     0.032      1.0     2.0     1.0        4
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$2650051 260010003 270050004 0.2413    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$2650052 000000000 000000000   0         5
*
*  1nnm    velf         velg            #
$2651051     0.0          0.0            5
*
*  2nnm     Dhyd       b       c       m          #
$2652051     0.032      1.0     2.0     1.0        5
*
**************************** VOLUME 270 *****************************
* Loop 2 sg riser
*=====================================================================
$2700000         riser2           pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
$2700001    5
*
*hydro   vol area    vol
$2700101   0.0          5
*
*hydro   jun area    jun
$2700201   0.0          4
*
*hydro  length       vol
$2700301  0.563         1
$2700302  0.476         4
$2700303  0.374         5
*
*hydro   volume      vol
$2700401   0.04553      1
$2700402   0.03701      4
$2700403   0.02909      5
*
*hydro   vert angle  vol
$2700601   90.0         5
*
*hydro   delta z     vol
$2700701   0.563        1
$2700702   0.476        4
$2700703   0.374        5
*
*hydro   roughness  hyd diam  vol
$2700801   1.0e-5      0.0376    5
*
*hydro    Kfwd       Krev     jun
$2700901   0.0        0.0        4
*
*hydro   fe         vol
$2701001  00          5
*
*hydro  fvcahs       jun
$2701101 001000         4
*
```

```
*hydro  ebt                                                            vol
$2701201  2          7.40e6      0.0        0.     0.       0.    5
*                                                         jun
$2701301   0.0         0.0      0.0             4
*         diamj       beta    c       m        jun
$2701401   0.0376      0.0     1.0     1.0       4
*
**************************** VOLUME 272 *****************************
* Loop 2 sg lower steam dome
*===============================================================================*
$2720000   lwrdom2    branch
*-------------------------------------------------------------------------------*
*         no. juns  vel/flow
$2720001   3         0
*         area                length          volume
$2720101   0.0                 0.630           0.09265
*         azim angle          incl angle      delta z
$2720102     0.                90.0            0.630
*         roughness           hyd dia         pvbfe
$2720103   5.0e-5              0.343           01000
*         ebt
$2720200     2    7.40e6      1.0
*         from      to        area      Kf    Kr    fvcahs
$2721101   270010000 272000000 0.07778   0.24  0.24  101000
$2722101   272010000 275000000 0.1521    0.0   0.0   001000
$2723101   272000000 260000000 0.02639   0.41  0.68  101000
*         velf       velg     veli
$2721201   0.0        0.0        0.   * 0.0
$2722201   0.0        0.0        0.   * 0.0
$2723201   0.0        0.0        0.   * 0.0
*         hyd dia   beta      y-int     slope
$2721110   0.376     1.00      1.00      1.00
$2722110   0.0       0.00      1.00      1.00
$2723110   0.04      0.00      1.00      1.00
*
*********************************************************************
* End of superseded components
*********************************************************************
*
**************************** VOLUME 270 *****************************
* Loop 2 sg riser
*=====================================================================
2700000         riser2           pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
2700001    5
*
*hydro   vol area    vol
2700101   0.0         5
*
*hydro   jun area    jun
2700201   0.0         4
*
*hydro  length       vol
2700301  0.563        1
2700302  0.476        4
2700303  0.374        5
*
*hydro   volume      vol
2700401   0.06039      1
2700402   0.04957      4
2700403   0.03896      5
*
*hydro   vert angle  vol
2700601   90.0        5
*
*hydro   delta z     vol
```

```
2700701   0.563        1
2700702   0.476        4
2700703   0.374        5
*
*hydro   roughness  hyd diam  vol
2700801   1.0e-5      0.0378    5
*
*hydro    Kfwd       Krev     jun
2700901   0.0        0.0       4
*
*hydro   fe         vol
2701001  00           5
*
*hydro  fvcahs       jun
2701101 001000         4
*
*hydro  ebt                                                 vol
2701201  0          7189175.    1267214.   2579955. .062518  0.  1
2701202  0          7185734.    1267115.   2579991. .1178208 0.  2
2701203  0          7182752.    1266981.   2580023. .162356  0.  3
2701204  0          7179957.    1266852.   2580052. .232651  0.  4
2701205  0          7177358.    1266189.   2580080. .0730707 0.  5
*                                              jun
2701301   -6.85585-4  .1899786 0.              1 * 1.543788-4
2701302   -.001454146 .2035578 0.              2 * 5.02938-4
2701303   -.00239415  .223328  0.              3 * .001018223
2701304   -.002647163 .2088886 0.              4 * .001880066
*         diamj       beta    c       m        jun
2701401   0.0376      0.0     1.0     1.0       4
*
***************************** VOLUME 272 ******************************
* Loop 2 sg lower steam dome
*===============================================================================*
2720000   lwrdom2    branch
*-------------------------------------------------------------------------------*
*         no. juns  vel/flow
2720001   2         0
*         area                length          volume
2720101   0.0                 0.630           0.09265
*         azim angle          incl angle      delta z
2720102     0.                90.0            0.630
*         roughness           hyd dia         pvbfe
2720103   5.0e-5              0.343           01000
*         ebt
2720200     0    7175301.    1242270. 2580074. .688236
*         from      to        area      Kf    Kr    fvcahs
2721101   270010000 272000000 0.10417   0.10  0.16  101000
2722101   272010000 275000000 0.1521    0.0   0.0   001000
*         velf       velg     veli
2721201   -.00931371 .796213    0.   * .00200009
2722201   -.710388   .0429469   0.   * .1671204
*         hyd dia   beta      y-int     slope
2721110   0.376     1.00      1.00      1.00
2722110   0.0       0.00      1.00      1.00
*
***************************** VOLUME 275 ******************************
* Loop 2 sg upper portion of steam dome
*======================================================================
2750000        uprdom2           pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
2750001    2
*
*hydro   vol area    vol
2750101   0.1521       2
*
*hydro   jun area    jun
2750201   0.0          1
*
*hydro  length       vol
2750301  0.470         2
*
*hydro   volume      vol
2750401   0.0         2
*
*hydro   vert angle  vol
2750601   90.0        2
*
*hydro   delta z     vol
2750701   0.470       2
*
*hydro   roughness  hyd diam  vol
2750801   1.0e-5     0.440     2
*
*hydro    Kfwd       Krev     jun
2750901   0.0        0.0       1
*
*hydro   fe         vol
2751001  00           2
*
*hydro  fvcahs       jun
2751101 001000         1
*
*hydro  ebt                                                    vol
2751201  0          7174417.    1266640.   2580099. .999978 0.   1
2751202  0          7174243.    1266631.   2580109. .999946 0.   2
*                                                jun
2751301   -.1468588   .0294791 0.              1 * .167496
*         diamj       beta    c       m        jun
2751401   0.440       0.0     1.0     1.0       1
*
***************************** VOLUME 280 ******************************
* Steam line 2
*======================================================================
2800000   stmlin2    branch
*-------------------------------------------------------------------------------
*         no. juns  vel/flow
2800001   1         0
*         area                length          volume
2800101   0.0003142           4.74            0.0
*         azim angle          incl angle      delta z
2800102   0.0                   0.0             0.0
*         roughness           hyd dia         pvbfe
2800103   5.0e-5              0.020           00000
*         ebt
2800200     0    7163829.    1266466. 2580322. .999949
*         from      to        area       Kf     Kr    fvcahs
2801101   275020004 280000000 0.0003142  0.0    0.0   001101
*         velf       velg     veli
2801201   .522809    14.22056   0.   * .16779
*         hyd dia   beta      y-int     slope
2801110   0.020     0.00      1.00      1.00
*
***************************** JUNCTION 281 ****************************
* Steam Line 2 Relief Valve
*=====================================================================$
2810000           relief2        valve
*----------------------------------------------------------------------
*
*hydro    from          to            area      kf    kr     vcahs
2810101   280010003     282000000     0.0003142 0.0   0.0    00102
*
*         hyd dia   beta      y-int     slope
2810110   0.020     0.00      1.00      1.00
*
```

```
*         ic     velf       velg     veli
2810201   0      0.         0.       0. * 0.
*
2810300   trpvlv
2810301    1281
*
**************************** VOLUME  282 *****************************
* Atmospheric boundary condition for steam relief
*====================================================================*
2820000   atmos2   tmdpvol
*--------------------------------------------------------------------*
*         area                length          volume
2820101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
2820102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
2820103   0.00000             0.0000          00010
*         ebt       trip          search var
2820200   003       0
*         indep var
2820201   0.00     1.013e5    300.0
*
**************************** JUNCTION 285 ****************************
* Steam Line 2 Isolation Valve
*===================================================================$
2850000                isolv2        valve
*-------------------------------------------------------------------
*
*hydro    from          to            area      kf    kr     vcahs
2850101   280010000     700010003     0.0003142 0.0   0.0    01101
*
*         hyd dia   beta      y-int     slope
2850110   0.020     0.00      1.00      1.00
*
*         ic     velf       velg     veli
2850201   0      .56955     14.24332 0. * .167749
*
2850300   mtrvlv
*
*         open  close  rate       ic
2850301    285   284   0.100000   1.    * 10 s closing time
*
*#####################################################################
*                             LOOP 3                                 $
*                       PRIMARY COOLANT SYSTEM                       $
*#####################################################################
*
**************************** VOLUME 301 *****************************
* Loop 3 hot leg
*=====================================================================
3010000          hotleg3          pipe
*--------------------------------------------------------------------*
*
*hydro   no. volumes
3010001   7
*
*hydro   vol area    vol
3010101   0.004536     7
*
*hydro   jun area    jun
3010201   0.004536     6
*
*hydro  length       vol
3010301  0.6683        3
3010302  0.420         4
3010303  0.567         7
*
*hydro   volume      vol
3010401   0.0          7
*
*hydro   horiz ang   vol
3010501  -135.0        7
*
*hydro   vert angle  vol
3010601   0.0          4
3010602  42.22         5
3010603  90.0          7
*
*hydro   delta z     vol
3010701   0.0          4
3010702   0.381        5
3010703   0.567        7
*
*hydro   roughness  hyd diam  vol
3010801   5.00e-5    0.076     7
*
*hydro    Kfwd       Krev     jun
3010901   0.0        0.0        3
3010902   0.25       0.25       4
3010903   0.0        0.0        6
*
*hydro   fe         vol
3011001  00           7
*
*hydro  fvcahs       jun
3011101 001000        6
*
*hydro  ebt                                                    vol
3011201  0         16891470.   1404572.   2412312. 0.     0.    1
3011202  0         16891440.   1404438.   2412312. 0.     0.    2
3011203  0         16891408.   1404304.   2412313. 0.     0.    3
3011204  0         16891384.   1404220.   2412314. 0.     0.    4
3011205  0         16890020.   1404107.   2412349. 0.     0.    5
3011206  0         16886770.   1403993.   2412433. 0.     0.    6
3011207  0         16882890.   1403880.   2412532. 0.     0.    7
*                                              jun
3011301   .731617     .731617  0.              1 * 2.3
3011302   .731557     .731557  0.              2 * 2.3
3011303   .731496     .731496  0.              3 * 2.3
3011304   .731458     .731458  0.              4 * 2.3
3011305   .731408     .731408  0.              5 * 2.3
3011306   .731361     .731361  0.              6 * 2.3
*
*         diamj       beta    c       m        jun
3011401   0.076       0.0     1.0     1.0       6
*
**************************** VOLUME 310 *****************************
* Steam generator 3 inlet transition region
*====================================================================
3100000   sginle3       branch
*--------------------------------------------------------------------------*
*         no. juns  vel/flow
3100001   2         0
*         area                length          volume
3100101   0.0                 0.210           0.00129
*         azim angle          incl angle      delta z
3100102   0.0                 90.0            0.210
*         roughness           hyd dia         pvbfe
3100103   5.00e-5             0.0             00000
*         ebt
3100200     0    16880318.  1403840. 2412599. 0.
*         from      to        area      Kf    Kr    fvcahs
3101101   301010000 310000000 0.004536 0.0    0.0   001000
3102101   310010000 315000000 0.004301 0.045  0.023 001000
*         velf       velg     veli
3101201   .731315    .731315    0.   * 2.3
```

```
3102201   .771258    .771258    0.   * 2.3
*         hyd dia   beta      y-int     slope
3101110   0.076     0.00      1.00      1.00
3102110   0.074     0.00      1.00      1.00
*
**************************** VOLUME 315 ******************************
* Steam generator 3 hot collector
*=======================================================================
3150000          sg1hotc          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
3150001   5
*
*hydro   vol area    vol
3150101   0.0         1
3150102   0.003632    4
3150103   0.0         5
*
*hydro   jun area    jun
3150201   0.0         4
*
*hydro  length       vol
3150301  0.508        1
3150302  0.476        4
3150303  0.429        5
*
*hydro   volume      vol
3150401   0.001849    1
3150402   0.0         4
3150403   0.001588    5
*
*hydro   horiz ang   vol
3150501   0.0         5
*
*hydro   vert angle  vol
3150601  90.0         5
*
*hydro   delta z     vol
3150701  0.508        1
3150702  0.476        4
3150703  0.429        5
*
*hydro   roughness  hyd diam  vol
3150801   5.00e-5     0.068     5
*
*hydro    Kfwd       Krev     jun
3150901   0.0        0.0       4
*
*hydro   fe         vol
3151001  00          5
*
*hydro  fvcahs       jun
3151101 001000        4
*
*hydro  ebt                                                     vol
3151201  0         16877684.   1402170.   2412666. 0.     0.    1
3151202  0         16874404.   1400504.   2412751. 0.     0.    2
3151203  0         16871222.   1398458.   2412833. 0.     0.    3
3151204  0         16868020.   1395798.   2412915. 0.     0.    4
3151205  0         16864946.   1391995.   2412994. 0.     0.    5
*                                             jun
3151301   .735625     .735625  0.             1 * 1.854415
3151302   .552487     .552487  0.             2 * 1.394168
3151303   .363973     .363973  0.             3 * .919609
3151304   .1701476    .1701476 0.             4 * .430585
*
*         diamj       beta    c       m        jun
3151401   0.068       0.0     1.0     1.0       4
*
*************************** JUNCTION 316 *****************************
* junctions between the hot collector and the sg tubes
*=======================================================================
3160000        hcjuns3        mtpljun
*-----------------------------------------------------------------------
3160001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
3160011 315050004 325000000 0.0007964 0.005 0.002 0001002  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
3160012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
3161011     .774193      .774193        1 * .430585
*
*  2nnm     Dhyd       b       c       m          #
3162011     0.013      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev  efvcahs  sub  2ph
3160021 315040004 324000000 0.0009291 0.005 0.002 0001002  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
3160022    -10000  -1000000   0         5
*
*  1nnm    velf         velg            #
3161021     .755407      .755407        2 * .489024
3161031     .734244      .734244        3 * .474559
3161041     .712987      .712987        4 * .460247
3161051     .690977      .690977        5 * .445585
*
*  2nnm     Dhyd       b       c       m          #
3162021     0.013      1.0     2.0     1.0        5
*
***************************** VOLUME 321 ******************************
* Steam generator 3 tubes row 1 (7 tubes)
*=======================================================================
3210000          sg3tub1          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
3210001   10
*
*hydro   vol area    vol
3210101   0.0009291   10
*
*hydro   jun area    jun
3210201   0.0          9
*
*hydro  length       vol
3210301  1.0656       10
*
*hydro   volume      vol
3210401   0.0         10
*
*hydro   horiz ang   vol
3210501   0.0         10
*
*hydro   vert angle  vol
3210601   0.0          1
3210602  -0.343        9
3210603   0.0         10
*
*hydro   delta z     vol
3210701  0.0           1
3210702 -0.006375      9
3210703  0.0          10
*
```

```
*hydro   roughness  hyd diam  vol
3210801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
3210901   0.047      0.047      9
*
*hydro   fe         vol
3211001  00          10
*
*hydro  fvcahs       jun
3211101 001000         9
*
*hydro  ebt                                                    vol
3211201  0          16877310.   1346853.   2412676. 0.     0.   1
3211202  0          16876940.   1312220.   2412686. 0.     0.   2
3211203  0          16876596.   1290357.   2412694. 0.     0.   3
3211204  0          16876258.   1276532.   2412703. 0.     0.   4
3211205  0          16875920.   1267674.   2412712. 0.     0.   5
3211206  0          16875584.   1261917.   2412720. 0.     0.   6
3211207  0          16875250.   1258115.   2412729. 0.     0.   7
3211208  0          16874916.   1255561.   2412738. 0.     0.   8
3211209  0          16874582.   1253815.   2412746. 0.     0.   9
3211210  0          16874226.   1252598.   2412755. 0.     0.   10
*                                              jun
3211301   .66939      .66939   0.               1 * .445585
3211302   .657068     .657068  0.               2 * .445585
3211303   .649809     .649809  0.               3 * .445585
3211304   .645314     .645314  0.               4 * .445585
3211305   .642521     .642521  0.               5 * .445585
3211306   .64074      .64074   0.               6 * .445585
3211307   .639578     .639578  0.               7 * .445585
3211308   .638804     .638804  0.               8 * .445585
3211309   .638278     .638278  0.               9 * .445585
*
*         diamj       beta    c       m        jun
3211401   0.013       0.0     1.0     1.0       9
*
***************************** VOLUME 322 ******************************
* Steam generator 3 tubes row 2 (7 tubes)
*=====================================================================
3220000          sg3tub2          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
3220001   10
*
*hydro   vol area    vol
3220101   0.0009291   10
*
*hydro   jun area    jun
3220201   0.0          9
*
*hydro  length       vol
3220301  1.0656       10
*
*hydro   volume      vol
3220401   0.0         10
*
*hydro   horiz ang   vol
3220501   0.0         10
*
*hydro   vert angle  vol
3220601   0.0          1
3220602  -0.343        9
3220603   0.0         10
*
*hydro   delta z     vol
3220701  0.0           1
```

```
3220702 -0.006375      9
3220703  0.0          10
*
*hydro   roughness  hyd diam  vol
3220801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
3220901   0.047      0.047      9
*
*hydro   fe         vol
3221001  00          10
*
*hydro  fvcahs       jun
3221101 001000         9
*
*hydro  ebt                                                    vol
3221201  0          1.6874+7    1346328.   2412761. 0.     0.   1
3221202  0          16873610.   1312195.   2412771. 0.     0.   2
3221203  0          16873242.   1290513.   2412781. 0.     0.   3
3221204  0          16872878.   1276721.   2412790. 0.     0.   4
3221205  0          16872516.   1267833.   2412799. 0.     0.   5
3221206  0          16872156.   1262025.   2412809. 0.     0.   6
3221207  0          16871796.   1258170.   2412818. 0.     0.   7
3221208  0          16871438.   1255570.   2412827. 0.     0.   8
3221209  0          16871078.   1253784.   2412836. 0.     0.   9
3221210  0          16870698.   1252535.   2412846. 0.     0.   10
*                                              jun
3221301   .691217     .691217  0.               1 * .460247
3221302   .678683     .678683  0.               2 * .460247
3221303   .671248     .671248  0.               3 * .460247
3221304   .666613     .666613  0.               4 * .460247
3221305   .663717     .663717  0.               5 * .460247
3221306   .66186      .66186   0.               6 * .460247
3221307   .660644     .660644  0.               7 * .460247
3221308   .65983      .65983   0.               8 * .460247
3221309   .659274     .659274  0.               9 * .460247
*
*         diamj       beta    c       m        jun
3221401   0.013       0.0     1.0     1.0       9
*
***************************** VOLUME 323 ******************************
* Steam generator 3 tubes row 3 (7 tubes)
*=====================================================================
3230000          sg3tub3          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
3230001   10
*
*hydro   vol area    vol
3230101   0.0009291   10
*
*hydro   jun area    jun
3230201   0.0          9
*
*hydro  length       vol
3230301  1.0656       10
*
*hydro   volume      vol
3230401   0.0         10
*
*hydro   horiz ang   vol
3230501   0.0         10
*
*hydro   vert angle  vol
3230601   0.0          1
3230602  -0.343        9
3230603   0.0         10
```

```
*
*hydro   delta z     vol
3230701  0.0           1
3230702 -0.006375      9
3230703  0.0          10
*
*hydro   roughness  hyd diam  vol
3230801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
3230901   0.047      0.047      9
*
*hydro   fe         vol
3231001  00          10
*
*hydro  fvcahs       jun
3231101 001000         9
*
*hydro  ebt                                                    vol
3231201  0          16870800.   1345534.   2412844. 0.     0.   1
3231202  0          16870378.   1311986.   2412855. 0.     0.   2
3231203  0          1.687+7     1290552.   2412865. 0.     0.   3
3231204  0          16869594.   1276838.   2412875. 0.     0.   4
3231205  0          16869208.   1267952.   2412885. 0.     0.   5
3231206  0          16868822.   1262115.   2412895. 0.     0.   6
3231207  0          16868438.   1258223.   2412904. 0.     0.   7
3231208  0          16868054.   1255585.   2412914. 0.     0.   8
3231209  0          16867670.   1253766.   2412924. 0.     0.   9
3231210  0          16867264.   1252490.   2412935. 0.     0.   10
*                                              jun
3231301   .712399     .712399  0.              1 * .474559
3231302   .699716     .699716  0.              2 * .474559
3231303   .692138     .692138  0.              3 * .474559
3231304   .687386     .687386  0.              4 * .474559
3231305   .684399     .684399  0.              5 * .474559
3231306   .682475     .682475  0.              6 * .474559
3231307   .681208     .681208  0.              7 * .474559
3231308   .680356     .680356  0.              8 * .474559
3231309   .679772     .679772  0.              9 * .474559
*
*         diamj       beta    c       m        jun
3231401   0.013       0.0     1.0     1.0       9
*
***************************** VOLUME 324 ******************************
* Steam generator 3 tubes row 4 (7 tubes)
*=====================================================================
3240000          sg3tub4          pipe
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
3240001   10
*
*hydro   vol area    vol
3240101   0.0009291   10
*
*hydro   jun area    jun
3240201   0.0          9
*
*hydro  length       vol
3240301  1.0656       10
*
*hydro   volume      vol
3240401   0.0         10
*
*hydro   horiz ang   vol
3240501   0.0         10
*
*hydro   vert angle  vol
3240601   0.0          1
3240602  -0.343        9
3240603   0.0         10
*
*hydro   delta z     vol
3240701  0.0           1
3240702 -0.006375      9
3240703  0.0          10
*
*hydro   roughness  hyd diam  vol
3240801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
3240901   0.047      0.047      9
*
*hydro   fe         vol
3241001  00          10
*
*hydro  fvcahs       jun
3241101 001000         9
*
*hydro  ebt                                                    vol
3241201  0          16867574.   1344330.   2412927. 0.     0.   1
3241202  0          16867124.   1311507.   2412938. 0.     0.   2
3241203  0          16866704.   1290416.   2412949. 0.     0.   3
3241204  0          16866288.   1276844.   2412960. 0.     0.   4
3241205  0          16865874.   1268002.   2412970. 0.     0.   5
3241206  0          16865464.   1262162.   2412981. 0.     0.   6
3241207  0          16865052.   1258250.   2412992. 0.     0.   7
3241208  0          16864642.   1255586.   2.413+6  0.     0.   8
3241209  0          16864232.   1253742.   2413013. 0.     0.   9
3241210  0          16863800.   1252443.   2413024. 0.     0.   10
*                                              jun
3241301   .733625     .733625  0.              1 * .489024
3241302   .72087      .72087   0.              2 * .489024
3241303   .713189     .713189  0.              3 * .489024
3241304   .708343     .708343  0.              4 * .489024
3241305   .70528      .70528   0.              5 * .489024
3241306   .703296     .703296  0.              6 * .489024
3241307   .701983     .701983  0.              7 * .489024
3241308   .701097     .701097  0.              8 * .489024
3241309   .700487     .700487  0.              9 * .489024
*
*         diamj       beta    c       m        jun
3241401   0.013       0.0     1.0     1.0       9
*
***************************** VOLUME 325 ******************************
* Steam generator tubes 3 row 5 (6 tubes)
*=====================================================================
3250000          sg3tub5          pipe
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
3250001   10
*
*hydro   vol area    vol
3250101   0.0007964   10
*
*hydro   jun area    jun
3250201   0.0          9
*
*hydro  length       vol
3250301  1.0656       10
*
*hydro   volume      vol
3250401   0.0         10
*
*hydro   horiz ang   vol
```

```
3250501   0.0         10
*
*hydro   vert angle  vol
3250601   0.0         1
3250602  -0.343       9
3250603   0.0        10
*
*hydro   delta z     vol
3250701  0.0          1
3250702 -0.006375     9
3250703  0.0         10
*
*hydro   roughness  hyd diam  vol
3250801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
3250901   0.047      0.047      9
*
*hydro   fe         vol
3251001  00          10
*
*hydro  fvcahs       jun
3251101 001000         9
*
*hydro  ebt                                                  vol
3251201  0          16864478.   1342338.   2413006. 0.     0.   1
3251202  0          1.6864+7    1310489.   2413019. 0.     0.   2
3251203  0          16863558.   1289920.   2413030. 0.     0.   3
3251204  0          16863118.   1276612.   2413042. 0.     0.   4
3251205  0          16862680.   1267896.   2413053. 0.     0.   5
3251206  0          16862242.   1262111.   2413064. 0.     0.   6
3251207  0          16861808.   1258216.   2413075. 0.     0.   7
3251208  0          16861372.   1255552.   2413086. 0.     0.   8
3251209  0          16860938.   1253700.   2413098. 0.     0.   9
3251210  0          16860482.   1252390.   2413109. 0.     0.   10
*                                              jun
3251301   .752758     .752758  0.              1 * .430585
3251302   .740101     .740101  0.              2 * .430585
3251303   .732413     .732413  0.              3 * .430585
3251304   .727537     .727537  0.              4 * .430585
3251305   .724437     .724437  0.              5 * .430585
3251306   .722418     .722418  0.              6 * .430585
3251307   .721076     .721076  0.              7 * .430585
3251308   .720166     .720166  0.              8 * .430585
3251309   .719536     .719536  0.              9 * .430585
*
*         diamj       beta    c       m        jun
3251401   0.013       0.0     1.0     1.0       9
*
**************************** JUNCTION 328 *****************************
* junctions between the sg tubes and the cold collector
*=====================================================================
3280000        ccjuns3        mtpljun
*---------------------------------------------------------------------
3280001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
3280011 325010000 329050003 0.0007964 0.005  0.002  001001  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
3280012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
3281011     .719093      .719093        1 * .430585
*
*  2nnm     Dhyd       b       c       m          #
3282011     0.013      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
```

```
3280021 324010000 329040003 0.0009291 0.005  0.002  001001  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
3280022  -1000000    -10000   0         5
*
*  1nnm    velf         velg            #
3281021     .70006       .70006         2 * .489024
3281031     .679364      .679364        3 * .474559
3281041     .658887      .658887        4 * .460247
3281051     .637913      .637913        5 * .445585
*
*  2nnm     Dhyd       b       c       m          #
3282021     0.013      1.0     2.0     1.0        5
*
***************************** VOLUME 329 ******************************
* Steam generator 3 cold collector
*=====================================================================
3290000          sg3cldc          pipe
*-----------------------------------------------------------------------------*
*
*hydro   no. volumes
3290001   6
*
*hydro   vol area    vol
3290101   0.0         1
3290102   0.003632    5
3290103   0.0         6
*
*hydro   jun area    jun
3290201   0.0         5
*
*hydro  length       vol
3290301  0.508        1
3290302  0.476        4
3290303  0.429        5
3290304  0.051        6
*
*hydro   volume      vol
3290401   0.001883    1
3290402   0.0         5
3290403   0.0002164   6
*
*hydro   horiz ang   vol
3290501   0.0         6
*
*hydro   vert angle  vol
3290601  90.0         6
*
*hydro   delta z     vol
3290701  0.508        1
3290702  0.476        4
3290703  0.429        5
3290704  0.051        6
*
*hydro   roughness  hyd diam  vol
3290801   5.00e-5     0.068     5
3290802   5.00e-5     0.074     6
*
*hydro    Kfwd       Krev     jun
3290901   0.0        0.0        4
3290902   0.016      0.032      5
*
*hydro   fe         vol
3291001  00          6
*
*hydro  fvcahs       jun
3291101 001000        5
*
*hydro  ebt                                                    vol
```

```
3291201  0          16874190.   1252369.   2412756. 0.     0.    1
3291202  0          16870660.   1252353.   2412847. 0.     0.    2
3291203  0          16867224.   1252337.   2412936. 0.     0.    3
3291204  0          16863760.   1252324.   2413025. 0.     0.    4
3291205  0          16860440.   1252318.   2413111. 0.     0.    5
3291206  0          16858670.   1263399.   2413156. 0.     0.    6
*                                             jun
3291301   -.679057    -.679057 0.              1 * -1.854415
3291302   -.51052     -.51052  0.              2 * -1.394168
3291303   -.336744    -.336744 0.              3 * -.919609
3291304   -.1576726   -.1576726 0.             4 * -.430585
3291305   8.09739-11  8.1105-11    0.          5 * 2.2113-10
*
*         diamj       beta    c       m        jun
3291401   0.068       0.0     1.0     1.0       5
*
**************************** VOLUME 330 ******************************
* Steam generator 3 inlet transition region
*=======================================================================
3300000   sgoutlt3      branch
*------------------------------------------------------------------------------*
*         no. juns  vel/flow
3300001   2         0
*         area                length          volume
3300101   0.0                 0.159           0.001069
*         azim angle          incl angle      delta z
3300102   0.0                -90.0           -0.159
*         roughness           hyd dia         pvbfe
3300103   5.00e-5             0.0             00000
*         ebt
3300200     0    16876738.  1252368. 2412691. 0.
*         from      to        area      Kf    Kr    fvcahs
3301101   329000000 330000000 0.004301 0.023  0.045 001000
3302101   330010000 335000000 0.004536 0.0    0.0   001000
*         velf       velg     veli
3301201   .711221    .711221    0. * 2.3
3302201   .674372    .674372    0. * 2.3
*         hyd dia   beta      y-int     slope
3301110   0.074     0.00      1.00      1.00
3302110   0.076     0.00      1.00      1.00
*
**************************** VOLUME 335 ******************************
* Loop 3 pump suction piping of cold leg
*=======================================================================
3350000          pmpsct3          pipe
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
3350001   14
*
*hydro   vol area    vol
3350101   0.004536    10
3350102   0.0         11
3350103   0.004536    14
*
*hydro   jun area    jun
3350201   0.004536    13
*
*hydro  length       vol
3350301  0.828         5
3350302  1.042         7
3350303  1.151         8
3350304  0.7495       10
3350305  0.75275      14
*
*hydro   volume      vol
3350401   0.0         10
3350402   0.006931    11
3350403   0.0         14
*
*hydro   horiz ang   vol
3350501  90.0         8
3350502 -85.0        14
*
*hydro   vert angle  vol
3350601 -90.0         8
3350602   0.0        10
3350603  90.0        14
*
*hydro   delta z     vol
3350701 -0.828        5
3350702 -0.7425       7
3350703 -0.965        8
3350704  0.0         10
3350705  0.65675     11
3350706  0.75275     14
*
*hydro   roughness  hyd diam  vol
3350801   5.00e-5    0.076    14
*
*hydro    Kfwd       Krev     jun
3350901   0.0        0.0        4
3350902   0.13       0.13       5
3350903   0.0        0.0        6
3350904   0.13       0.13       7
3350905   0.25       0.25       8
3350906   0.0        0.0        9
3350907   0.25       0.25      10
3350908   0.0        0.0       13
*
*hydro   fe         vol
3351001  00          14
*
*hydro  fvcahs       jun
3351101 001000        13
*
*hydro  ebt                                                       vol
3351201  0         16880266.   1252220.   2412600. 0.     0.   1
3351202  0         16886336.   1252073.   2412444. 0.     0.   2
3351203  0         16892408.   1251925.   2412287. 0.     0.   3
3351204  0         16898480.   1251777.   2412131. 0.     0.   4
3351205  0         16904552.   1251630.   2411975. 0.     0.   5
3351206  0         16910282.   1251444.   2411828. 0.     0.   6
3351207  0         16915716.   1251259.   2411683. 0.     0.   7
3351208  0         16921946.   1251053.   2411498. 0.     0.   8
3351209  0         16925424.   1250920.   2411395. 0.     0.   9
3351210  0         16925392.   1250786.   2411396. 0.     0.   10
3351211  0         16923034.   1250581.   2411466. 0.     0.   11
3351212  0         16917684.   1250447.   2411625. 0.     0.   12
3351213  0         16912096.   1250312.   2411781. 0.     0.   13
3351214  0         16906508.   1250178.   2411925. 0.     0.   14
*                                              jun
3351301   .674322     .674322  0.              1 * 2.3
3351302   .67427      .67427   0.              2 * 2.3
3351303   .674219     .674219  0.              3 * 2.3
3351304   .674167     .674167  0.              4 * 2.3
3351305   .674115     .674115  0.              5 * 2.3
3351306   .674051     .674051  0.              6 * 2.3
3351307   .673988     .673988  0.              7 * 2.3
3351308   .673918     .673918  0.              8 * 2.3
3351309   .673873     .673873  0.              9 * 2.3
3351310   .673831     .673831  0.              10 * 2.3
3351311   .673768     .673768  0.              11 * 2.3
3351312   .67373      .67373   0.              12 * 2.3
3351313   .673693     .673693  0.              13 * 2.3
*
```

```
*         diamj       beta    c       m        jun
3351401   0.076       0.0     1.0     1.0      13
 3
*********************************  VOLUME 340  ******************************
* Loop 3 primary coolant pump
*
*=======================================================================
3400000   mcp3        pump
*---------------------------------------------------------------------------*
*         area                length          volume
3400101   0.0                 0.746           0.010
*         azim angle     incl angle      delta z   pvbfe
3400102   0.0            30.0            0.370     00000
*         from      jun area  Kf    Kr    efvcahs
3400108   335010000 0.004536  0.0   0.0   0001000
*         to        jun area  Kf    Kr    efvcahs
3400109   342000000 0.004536  0.0   0.0   0001000
*         hyd dia   beta      y-int     slope
3400110   0.076     0.00      1.00      1.00
3400111   0.076     0.00      1.00      1.00
*         ebt
3400200     0    16907300.  1243874. 2411905. 0.
*         vel/flow  liquid    vapor     int-face
3400201   0         .673655   .673655   0. * 2.3
3400202   0         .671674   .671674   0. * 2.3
*         tabdat-i  2ph-i  2phdiff-i torque-i  pvel-i  trip  rev-i
3400301   -2        -1     -3        -1        0       1340  1
*         rated vel  in/rated vel  rated flow  rated head
3400302   314.2      .12436        0.022       100.
*         rated torq   mom-iner  rated dens  rated m-torq
3400303   57.2         3.7-2     750.0       0.00
*         coeff-tf2  coeff-tf0  coeff-tf1  coeff-tf3
3400304   0.57       0.57       0.0       0.0
*
*hydro        trip no.          parameter no.
3406100         340            cntrlvar  340
*
*hydro        indp var          speed (rad/s)
3406101        -1.0             314.2
3406102         0.0                0.
3406103       500.0              500.
*
***************************** VOLUME 342 ******************************
* Piping from pump discharge to isolation valve
*=====================================================================$
*hydro             component name      component type
3420000               pmp3out             snglvol
*---------------------------------------------------------------------$
*hydro            area               length              volume
3420101           0.004536           0.880               0.0
*
*hydro         horz angle          vert angle            delta z
3420102          80.0                0.0                   0.0
*
*hydro          roughness           hyd diam               fe
3420103          0.00005            0.076                  00
*
*hydro  ebt pressure     tempe
3420200   0    16910562.  1243628. 2411821. 0.
*
**************************** JUNCTION 343 ****************************
* Cold leg isolation valve
*===================================================================$
3430000               cl3vlv        valve
*---------------------------------------------------------------------
*
*hydro    from          to            area     kf    kr     vcahs
3430101   342010000     345000000    0.004536 0.0    0.0    00100
*
3430201   0        .671592 .671592 0. * 2.3
*
3430300   mtrvlv
*
*         open  close  rate  ic
3430301   342   343    0.1   1.
*
**************************** VOLUME 345 ******************************
* Loop 3 reactor vessel inlet section of cold leg
*=======================================================================
3450000          cldleg3          pipe
*---------------------------------------------------------------------------*
*
*hydro   no. volumes
3450001   4
*
*hydro   vol area    vol
3450101   0.004536     4
*
*hydro   jun area    jun
3450201   0.004536     3
*
*hydro  length       vol
3450301  0.782         3
3450302  0.741         4
*
*hydro   volume      vol
3450401   0.0         4
*
*hydro   horiz ang   vol
3450501    80.0       3
3450502    35.0       4
*
*hydro   vert angle  vol
3450601   0.0         4
*
*hydro   delta z     vol
3450701   0.0         4
*
*hydro   roughness  hyd diam  vol
3450801   5.00e-5     0.076     4
*
*hydro    Kfwd       Krev     jun
3450901   0.0        0.0       2
3450902   0.16       0.16      3
*
*hydro   fe         vol
3451001  00          4
*
*hydro  fvcahs       jun
3451101 001000        3
*
*hydro  ebt                                                    vol
3451201  0          16910528.   1243490.   2411822. 0.     0.   1
3451202  0          16910496.   1243351.   2411822. 0.     0.   2
3451203  0          16910462.   1243213.   2411823. 0.     0.   3
3451204  0          16910402.   1243082.   2411825. 0.     0.   4
*                                              jun
3451301   .671548     .671548  0.              1 * 2.3
3451302   .671504     .671504  0.              2 * 2.3
3451303   .671459     .671459  0.              3 * 2.3
*
*         diamj       beta    c       m        jun
3451401   0.076       0.0     1.0     1.0       3
*
*########################################################################
*                            LOOP 3                                     $
```

```
*                    SECONDARY COOLANT SYSTEM                          $
*######################################################################
**************************** VOLUME 350 ******************************
* Loop 3 Main Feedwater source
*=====================================================================
3500000   mfw3src   tmdpvol
*---------------------------------------------------------------------*
*         area                length          volume
3500101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
3500102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
3500103   0.00000             0.0000          00010
*         ebt       trip          search var
3500200   003       0
*         indep var
3500201   0.00     10.0e6     443.15
*
**************************** JUNCTION 351 ****************************
* Loop 3 main feedwater flow
*=====================================================================
3510000   mfw3      tmdpjun
*
*         From      To        Area
3510101   350010000 359000000 0.0009079
*
*        vel/Kg     trip      var req.  # var req
3510200   1         351                              * trancalc
*
*         Time    kg/s      kg/s      m/s
3510201    0.0    0.1667    0.        0.             * trancalc
3510202    9.0    0.1667    0.        0.             * trancalc
3510203   10.0    0.0       0.        0.             * trancalc
*
**************************** VOLUME 355 ******************************
* Loop 3 Auxiliary Feedwater source
*=====================================================================
3550000   afw3src  tmdpvol
*---------------------------------------------------------------------*
*         area                length          volume
3550101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
3550102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
3550103   0.00000             0.0000          00010
*         ebt       trip          search var
3550200   003       0
*         indep var
3550201   0.00     16.0e6     443.15
*
**************************** JUNCTION 356 ****************************
* Loop 3 auxiliary feedwater flow
*=====================================================================
3560000   afw3      tmdpjun
*
*         From      To        Area
3560101   355010000 359000000 0.0009079
*
*        vel/Kg     trip      var req.  # var req
3560200   1         356
*
*         Time    kg/s      kg/s      m/s
3560201   -1.     0.0       0.        0.
3560202    0.0    0.0       0.        0.
*
**************************** VOLUME 359 ******************************
* Loop 3 Feedwater ring
*=====================================================================
3590000   fwring3    branch
*-----------------------------------------------------------------------------
*         no. juns  vel/flow
3590001   1         0
*         area                length          volume
3590101   0.0009079           1.062           0.0
*         azim angle          incl angle      delta z
3590102   0.0                  0.0             0.000
*         roughness           hyd dia         pvbfe
3590103   5.0e-5              0.034           00000
*         ebt
3590200     0    7173545.   791716. 2580122. 0.
*         from      to        area      Kf    Kr    fvcahs
3591101   359010000 372010003 0.009651 0.0    0.0   001000
*         velf       velg     veli
3591201   .01956143  .0981506   0.   * .166677
*         hyd dia   beta      y-int     slope
3591110   0.008     0.00      1.00      1.00
*
**********************************************************************
* These components have been superseded.  They are being left in the
* input deck for possible future use.
**********************************************************************
*
**************************** VOLUME 360 ******************************
* Loop 3 sg downcomer
*=====================================================================
$3600000            dc3           annulus
*-----------------------------------------------------------------------------*
*
*hydro   no. volumes
$3600001    5
*
*hydro   vol area    vol
$3600101   0.0         5
*
*hydro   jun area    jun
$3600201   0.0         4
*
*hydro  length       vol
$3600301  0.374        1
$3600302  0.476        4
$3600303  0.563        5
*
*hydro   volume      vol
$3600401   0.00987      1
$3600402   0.01256      4
$3600403   0.01486      5
*
*hydro   vert angle  vol
$3600601  -90.0        5
*
*hydro   delta z     vol
$3600701  -0.374       1
$3600702  -0.476       4
$3600703  -0.563       5
*
*hydro   roughness  hyd diam  vol
$3600801   1.0e-5     0.04      5
*
*hydro    Kfwd       Krev     jun
$3600901   0.0        0.0       4
*
*hydro   fe         vol
$3601001  00          5
*
*hydro  fvcahs       jun
$3601101 001000        4
```

```
*
*hydro  ebt                                                    vol
$3601201  2          7.40e6      0.0        0.     0.       0.    5
*                                              jun
$3601301   0.0         0.0      0.0              4
*         diamj       beta    c       m        jun
$3601401   0.04        0.0     1.0     1.0       4
*
**************************** JUNCTION 365 ****************************
* Loop 3 sg downcomer-to-riser connection
*=======================================================================
$3650000   dcrisr3   mtpljun
*-----------------------------------------------------------------------
$3650001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$3650011 360050003 370010004 0.3694    0.2   0.2    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$3650012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
$3651011     0.0          0.0            1
*
*  2nnm     Dhyd       b       c       m          #
$3652011     0.032      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$3650021 360040003 370020004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$3650022 000000000 000000000   0         2
*
*  1nnm    velf         velg            #
$3651021     0.0          0.0            2
*
*  2nnm     Dhyd       b       c       m          #
$3652021     0.032      1.0     2.0     1.0        2
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$3650031 360030003 370030004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$3650032 000000000 000000000   0         3
*
*  1nnm    velf         velg            #
$3651031     0.0          0.0            3
*
*  2nnm     Dhyd       b       c       m          #
$3652031     0.032      1.0     2.0     1.0        3
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$3650041 360020003 370040004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$3650042 000000000 000000000   0         4
*
*  1nnm    velf         velg            #
$3651041     0.0          0.0            4
*
*  2nnm     Dhyd       b       c       m          #
$3652041     0.032      1.0     2.0     1.0        4
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$3650051 360010003 370050004 0.2413    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$3650052 000000000 000000000   0         5
*
*  1nnm    velf         velg            #
$3651051     0.0          0.0            5
*
*  2nnm     Dhyd       b       c       m          #
$3652051     0.032      1.0     2.0     1.0        5
*
**************************** VOLUME 370 *****************************
* Loop 3 sg riser
*=====================================================================
$3700000         riser3           annulus
*-----------------------------------------------------------------------*
*
*hydro   no. volumes
$3700001    5
*
*hydro   vol area    vol
$3700101   0.0         5
*
*hydro   jun area    jun
$3700201   0.0         4
*
*hydro  length       vol
$3700301  0.563        1
$3700302  0.476        4
$3700303  0.374        5
*
*hydro   volume      vol
$3700401   0.04553      1
$3700402   0.03701      4
$3700403   0.02909      5
*
*hydro   vert angle  vol
$3700601   90.0        5
*
*hydro   delta z     vol
$3700701   0.563       1
$3700702   0.476       4
$3700703   0.374       5
*
*hydro   roughness  hyd diam  vol
$3700801   1.0e-5     0.0376    5
*
*hydro    Kfwd       Krev     jun
$3700901   0.0        0.0       4
*
*hydro   fe         vol
$3701001  00          5
*
*hydro  fvcahs       jun
$3701101 001000        4
*
*hydro  ebt                                                    vol
$3701201  2          7.40e6      0.0        0.     0.       0.    5
*                                              jun
$3701301   0.0         0.0      0.0              4
*         diamj       beta    c       m        jun
$3701401   0.0376      0.0     1.0     1.0       4
*
**************************** VOLUME 372 *****************************
* Loop 3 sg lower steam dome
*=======================================================================*
$3720000   lwrdom3    branch
*-----------------------------------------------------------------------*
*         no. juns  vel/flow
$3720001   3         0
*         area                length          volume
$3720101   0.0                 0.630           0.09265
*         azim angle          incl angle      delta z
$3720102     0.                90.0            0.630
*         roughness           hyd dia         pvbfe
$3720103   5.0e-5              0.343           01000
*         ebt
```

```
$3720200     2    7.40e6      1.0
*         from      to        area      Kf    Kr    fvcahs
$3721101   370010000 372000000 0.07778   0.24  0.24  101000
$3722101   372010000 375000000 0.1521    0.0   0.0   001000
$3723101   372000000 360000000 0.02639   0.41  0.68  101000
*         velf       velg     veli
$3721201   0.0        0.0        0.   * 0.0
$3722201   0.0        0.0        0.   * 0.0
$3723201   0.0        0.0        0.   * 0.0
*         hyd dia   beta      y-int     slope
$3721110   0.0376    1.00      1.00      1.00
$3722110   0.0       0.00      1.00      1.00
$3723110   0.04      0.00      1.00      1.00
*
***********************************************************************
* End of superseded components
***********************************************************************
*
**************************** VOLUME 370 *****************************
* Loop 3 sg riser
*====================================================================
3700000         riser3           annulus
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
3700001    5
*
*hydro   vol area    vol
3700101   0.0         5
*
*hydro   jun area    jun
3700201   0.0         4
*
*hydro  length       vol
3700301  0.563        1
3700302  0.476        4
3700303  0.374        5
*
*hydro   volume      vol
3700401   0.06039     1
3700402   0.04957     4
3700403   0.03896     5
*
*hydro   vert angle  vol
3700601   90.0        5
*
*hydro   delta z     vol
3700701   0.563       1
3700702   0.476       4
3700703   0.374       5
*
*hydro   roughness  hyd diam  vol
3700801   1.0e-5      0.0378    5
*
*hydro    Kfwd       Krev     jun
3700901   0.0        0.0       4
*
*hydro   fe         vol
3701001  00          5
*
*hydro  fvcahs       jun
3701101 001000        4
*
*hydro  ebt                                                   vol
3701201  0         7187794.    1267142.   2579971. .0625546 0.  1
3701202  0         7184354.    1267043.   2580007. .1177608 0.  2
3701203  0         7181374.    1266909.   2580038. .163698  0.  3
3701204  0         7178565.    1266781.   2580068. .2226327 0.  4
```

```
3701205  0          7176041.    1266513.   2580094. .143099  0.  5
*                                              jun
3701301   -6.91284-4  .1899745 0.              1 * -2.207933-4
3701302   -.001475745 .2037483 0.              2 * -7.17997-4
3701303   -.00240486  .221549  0.              3 * -.001464562
3701304   -.00293224  .218348  0.              4 * -.0026004
*         diamj       beta    c       m       jun
3701401   0.0376      0.0     1.0     1.0       4
*
**************************** VOLUME 372 ******************************
* Loop 3 sg lower steam dome
*============================================================================*
3720000   lwrdom3    branch
*----------------------------------------------------------------------------*
*         no. juns  vel/flow
3720001   2         0
*         area                length          volume
3720101   0.0                 0.630           0.09265
*         azim angle          incl angle      delta z
3720102     0.                90.0            0.630
*         roughness           hyd dia         pvbfe
3720103   5.0e-5              0.343           01000
*         ebt
3720200     0    7173556.    1.257+6  2580112. .4469255
*         from      to        area      Kf    Kr    fvcahs
3721101   370010000 372000000 0.10417   0.10  0.16  101000
3722101   372010000 375000000 0.1521    0.0   0.0   001000
*         velf       velg     veli
3721201   -.0054616  .410564    0.   * -.00315106
3722201   -.408744   .065757    0.   * .1660922
*         hyd dia   beta      y-int     slope
3721110   0.0376    1.00      1.00      1.00
3722110   0.0       0.00      1.00      1.00
*
**************************** VOLUME 375 ******************************
* Loop 3 sg upper portion of steam dome
*=====================================================================
3750000        uprdom3           pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
3750001    2
*
*hydro   vol area    vol
3750101   0.1521       2
*
*hydro   jun area    jun
3750201   0.0         1
*
*hydro  length       vol
3750301  0.470        2
*
*hydro   volume      vol
3750401   0.0         2
*
*hydro   vert angle  vol
3750601   90.0        2
*
*hydro   delta z     vol
3750701   0.470       2
*
*hydro   roughness  hyd diam  vol
3750801   1.0e-5      0.440     2
*
*hydro    Kfwd       Krev     jun
3750901   0.0        0.0       1
*
*hydro   fe         vol
```

```
3751001  00          2
*
*hydro  fvcahs       jun
3751101 001000        1
*
*hydro  ebt                                                   vol
3751201  0          7172153.    1266527.   2580125. .999962 0.   1
3751202  0          7171980.    1266518.   2580135. .99995  0.   2
*                                                  jun
3751301   -.160925    .0291526  0.               1 * .165556
*         diamj       beta    c       m        jun
3751401   0.440       0.0     1.0     1.0       1
*
**************************** VOLUME 380 ******************************
* Steam line 3
*======================================================================
3800000   stmlin3    branch
*-------------------------------------------------------------------------------
*         no. juns  vel/flow
3800001   1         0
*         area                length          volume
3800101   0.0003142           4.74            0.0
*         azim angle          incl angle      delta z
3800102   0.0                   0.0            0.0
*         roughness           hyd dia         pvbfe
3800103   5.0e-5              0.020           00000
*         ebt
3800200     0    7161301.    1265995. 2580352. .999952
*         from      to        area       Kf     Kr    fvcahs
3801101   375020004 380000000 0.0003142  0.0    0.0   001101
*         velf       velg     veli
3801201   13.93105   13.98425   0.   * .1650946
*         hyd dia   beta      y-int     slope
3801110   0.020     0.00      1.00      1.00
*
**************************** JUNCTION 381 ****************************
* Steam Line 3 Relief Valve
*=====================================================================$
3810000           relief3        valve
*----------------------------------------------------------------------
*
*hydro    from          to            area      kf    kr     vcahs
3810101   380010003     382000000     0.0003142 0.0   0.0    00102
*
*         hyd dia   beta      y-int     slope
3810110   0.020     0.00      1.00      1.00
*
*         ic     velf       velg     veli
3810201   0      0.         0.       0. * 0.
*
3810300   trpvlv
3810301    1381
*
**************************** VOLUME  382 *****************************
* Atmospheric boundary condition for steam relief
*=====================================================================*
3820000   atmos3   tmdpvol
*---------------------------------------------------------------------*
*         area                length          volume
3820101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
3820102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
3820103   0.00000             0.0000          00010
*         ebt       trip          search var
3820200   003       0
*         indep var
3820201   0.00     1.013e5    300.0
```

```
*
***************************** JUNCTION 385 *****************************
* Steam Line 3 Isolation Valve
*=====================================================================$
3850000                isolv3        valve
*----------------------------------------------------------------------
*
*hydro    from          to            area      kf    kr     vcahs
3850101   380010000     700040003     0.0003142 0.0   0.0    01101
*
*         hyd dia   beta      y-int     slope
3850110   0.020     0.00      1.00      1.00
*
*         ic     velf       velg     veli
3850201   0      13.96317   14.01004 0. * .1650895
*
3850300   mtrvlv
*
*          open  close rate       ic
3850301    385   384   0.052632  1.    * 19 s closing time
*
*#######################################################################
*                            LOOP 4                                    $
*                       PRIMARY COOLANT SYSTEM                         $
*#######################################################################
*
**************************** VOLUME 401 ******************************
* Loop 4 hot leg
*=======================================================================
4010000          hotleg4          pipe
*---------------------------------------------------------------------*
*
*hydro   no. volumes
4010001   7
*
*hydro   vol area    vol
4010101   0.004536     7
*
*hydro   jun area    jun
4010201   0.004536     6
*
*hydro  length       vol
4010301  0.6683        3
4010302  0.420         4
4010303  0.567         7
*
*hydro   volume      vol
4010401   0.0          7
*
*hydro   horiz ang   vol
4010501  135.0         7
*
*hydro   vert angle  vol
4010601   0.0          4
4010602  42.22         5
4010603  90.0          7
*
*hydro   delta z     vol
4010701   0.0          4
4010702   0.381        5
4010703   0.567        7
*
*hydro   roughness  hyd diam  vol
4010801   5.00e-5     0.076     7
*
*hydro    Kfwd       Krev     jun
4010901   0.0        0.0       3
4010902   0.25       0.25      4
```

```
4010903   0.0        0.0        6
*
*hydro   fe         vol
4011001  00           7
*
*hydro  fvcahs       jun
4011101 001000         6
*
*hydro  ebt                                                    vol
4011201  0          16891448.   1404577.   2412312. 0.     0.    1
4011202  0          16891414.   1404449.   2412313. 0.     0.    2
4011203  0          16891380.   1404321.   2412314. 0.     0.    3
4011204  0          16891354.   1404239.   2412315. 0.     0.    4
4011205  0          1.689+7     1404130.   2412350. 0.     0.    5
4011206  0          16886732.   1404021.   2412433. 0.     0.    6
4011207  0          16882850.   1403913.   2412533. 0.     0.    7
*                                              jun
4011301   .76343      .76343   0.              1 * 2.4
4011302   .763369     .763369  0.              2 * 2.4
4011303   .763308     .763308  0.              3 * 2.4
4011304   .76327      .76327   0.              4 * 2.4
4011305   .76322      .76322   0.              5 * 2.4
4011306   .763173     .763173  0.              6 * 2.4
*
*         diamj       beta    c       m        jun
4011401   0.076       0.0     1.0     1.0       6
*
**************************** VOLUME 410 ******************************
* Steam generator 4 inlet transition region
*======================================================================
4100000   sginle4       branch
*----------------------------------------------------------------------------*
*         no. juns  vel/flow
4100001   2         0
*         area                length          volume
4100101   0.0                 0.210           0.00129
*         azim angle          incl angle      delta z
4100102   0.0                 90.0            0.210
*         roughness           hyd dia         pvbfe
4100103   5.00e-5             0.0             00000
*         ebt
4100200     0    16880284.  1403875. 2412599. 0.
*         from      to        area      Kf    Kr    fvcahs
4101101   401010000 410000000 0.004536 0.0    0.0   001000
4102101   410010000 415000000 0.004301 0.045  0.023 001000
*         velf       velg     veli
4101201   .763127    .763127    0.   * 2.4
4102201   .804808    .804808    0.   * 2.4
*         hyd dia   beta      y-int     slope
4101110   0.076     0.00      1.00      1.00
4102110   0.074     0.00      1.00      1.00
*
**************************** VOLUME 415 ******************************
* Steam generator 4 hot collector
*======================================================================
4150000          sg1hotc          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
4150001   5
*
*hydro   vol area    vol
4150101   0.0          1
4150102   0.003632     4
4150103   0.0          5
*
*hydro   jun area    jun
4150201   0.0          4
```

```
*
*hydro  length       vol
4150301  0.508         1
4150302  0.476         4
4150303  0.429         5
*
*hydro   volume      vol
4150401   0.001849     1
4150402   0.0          4
4150403   0.001588     5
*
*hydro   horiz ang   vol
4150501   0.0          5
*
*hydro   vert angle  vol
4150601  90.0          5
*
*hydro   delta z     vol
4150701  0.508         1
4150702  0.476         4
4150703  0.429         5
*
*hydro   roughness  hyd diam  vol
4150801   5.00e-5     0.068     5
*
*hydro    Kfwd       Krev     jun
4150901   0.0        0.0       4
*
*hydro   fe         vol
4151001  00           5
*
*hydro  fvcahs       jun
4151101 001000         4
*
*hydro  ebt                                                    vol
4151201  0          16877632.   1402264.   2412668. 0.     0.    1
4151202  0          16874362.   1400652.   2412752. 0.     0.    2
4151203  0          16871184.   1398667.   2412834. 0.     0.    3
4151204  0          1.6868+7    1396076.   2412916. 0.     0.    4
4151205  0          16864916.   1392405.   2412995. 0.     0.    5
*                                              jun
4151301   .76667      .76667   0.              1 * 1.932563
4151302   .57515      .57515   0.              2 * 1.451223
4151303   .378507     .378507  0.              3 * .956207
4151304   .1767697    .1767697 0.              4 * .447267
*
*         diamj       beta    c       m        jun
4151401   0.068       0.0     1.0     1.0       4
*
**************************** JUNCTION 416 *****************************
* junctions between the hot collector and the sg tubes
*======================================================================
4160000        hcjuns4         mtpljun
*----------------------------------------------------------------------
4160001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
4160011 415050004 425000000 0.0007964 0.005 0.002 0001002  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
4160012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
4161011     .804386      .804386        1 * .447267
*
*  2nnm     Dhyd       b       c       m          #
4162011     0.013      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev  efvcahs  sub  2ph
```

```
4160021 415040004 424000000 0.0009291 0.005 0.002 0001002  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
4160022    -10000  -1000000   0         5
*
*  1nnm    velf         velg            #
4161021     .786303      .786303        2 * .508939
4161031     .765993      .765993        3 * .495016
4161041     .74573       .74573         4 * .48134
4161051     .724905      .724905        5 * .467437
*
*  2nnm     Dhyd       b       c       m          #
4162021     0.013      1.0     2.0     1.0        5
*
**************************** VOLUME 421 ******************************
* Steam generator 4 tubes row 1 (7 tubes)
*========================================================================
4210000          sg4tub1          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
4210001   10
*
*hydro   vol area    vol
4210101   0.0009291   10
*
*hydro   jun area    jun
4210201   0.0          9
*
*hydro  length       vol
4210301  1.0656       10
*
*hydro   volume      vol
4210401   0.0         10
*
*hydro   horiz ang   vol
4210501   0.0         10
*
*hydro   vert angle  vol
4210601   0.0          1
4210602  -0.343        9
4210603   0.0         10
*
*hydro   delta z     vol
4210701  0.0           1
4210702 -0.006375      9
4210703  0.0          10
*
*hydro   roughness  hyd diam  vol
4210801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
4210901   0.047      0.047      9
*
*hydro   fe         vol
4211001  00         10
*
*hydro  fvcahs       jun
4211101 001000         9
*
*hydro  ebt                                                  vol
4211201  0          16877222.   1347809.   2412678. 0.     0.   1
4211202  0          16876812.   1313410.   2412689. 0.     0.   2
4211203  0          16876432.   1291490.   2412699. 0.     0.   3
4211204  0          16876054.   1277512.   2412708. 0.     0.   4
4211205  0          16875680.   1268484.   2412718. 0.     0.   5
4211206  0          16875306.   1262573.   2412728. 0.     0.   6
4211207  0          16874934.   1258642.   2412737. 0.     0.   7
4211208  0          16874562.   1255986.   2412747. 0.     0.   8
4211209  0          16874192.   1254159.   2412756. 0.     0.   9
4211210  0          16873798.   1252880.   2412766. 0.     0.   10
*                                              jun
4211301   .702594     .702594  0.              1 * .467437
4211302   .689715     .689715  0.              2 * .467437
4211303   .682072     .682072  0.              3 * .467437
4211304   .67729      .67729   0.              4 * .467437
4211305   .674297     .674297  0.              5 * .467437
4211306   .672374     .672374  0.              6 * .467437
4211307   .671113     .671113  0.              7 * .467437
4211308   .670267     .670267  0.              8 * .467437
4211309   .66969      .66969   0.              9 * .467437
*
*         diamj       beta    c       m        jun
4211401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 422 ******************************
* Steam generator 4 tubes row 2 (7 tubes)
*========================================================================
4220000          sg4tub2          pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
4220001   10
*
*hydro   vol area    vol
4220101   0.0009291   10
*
*hydro   jun area    jun
4220201   0.0          9
*
*hydro  length       vol
4220301  1.0656       10
*
*hydro   volume      vol
4220401   0.0         10
*
*hydro   horiz ang   vol
4220501   0.0         10
*
*hydro   vert angle  vol
4220601   0.0          1
4220602  -0.343        9
4220603   0.0         10
*
*hydro   delta z     vol
4220701  0.0           1
4220702 -0.006375      9
4220703  0.0          10
*
*hydro   roughness  hyd diam  vol
4220801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
4220901   0.047      0.047      9
*
*hydro   fe         vol
4221001  00         10
*
*hydro  fvcahs       jun
4221101 001000         9
*
*hydro  ebt                                                  vol
4221201  0          16873926.   1347257.   2412763. 0.     0.   1
4221202  0          16873492.   1313335.   2412774. 0.     0.   2
4221203  0          16873086.   1291596.   2412785. 0.     0.   3
4221204  0          16872684.   1277659.   2412795. 0.     0.   4
4221205  0          16872284.   1268611.   2412805. 0.     0.   5
```

```
4221206  0          16871886.   1262656.   2412816. 0.     0.   6
4221207  0          16871490.   1258679.   2412826. 0.     0.   7
4221208  0          16871092.   1255981.   2412836. 0.     0.   8
4221209  0          16870698.   1254118.   2412846. 0.     0.   9
4221210  0          16870278.   1252809.   2412857. 0.     0.   10
*                                                jun
4221301   .723271     .723271  0.                1 * .48134
4221302   .710204     .710204  0.                2 * .48134
4221303   .702399     .702399  0.                3 * .48134
4221304   .697488     .697488  0.                4 * .48134
4221305   .694397     .694397  0.                5 * .48134
4221306   .692403     .692403  0.                6 * .48134
4221307   .691088     .691088  0.                7 * .48134
4221308   .690204     .690204  0.                8 * .48134
4221309   .689597     .689597  0.                9 * .48134
*
*         diamj       beta    c       m        jun
4221401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 423 ******************************
* Steam generator 4 tubes row 3 (7 tubes)
*=====================================================================
4230000          sg4tub3          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
4230001   10
*
*hydro   vol area    vol
4230101   0.0009291   10
*
*hydro   jun area    jun
4230201   0.0          9
*
*hydro  length       vol
4230301  1.0656       10
*
*hydro   volume      vol
4230401   0.0         10
*
*hydro   horiz ang   vol
4230501   0.0         10
*
*hydro   vert angle  vol
4230601   0.0          1
4230602  -0.343        9
4230603   0.0         10
*
*hydro   delta z     vol
4230701  0.0           1
4230702 -0.006375      9
4230703  0.0          10
*
*hydro   roughness  hyd diam  vol
4230801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
4230901   0.047      0.047      9
*
*hydro   fe         vol
4231001  00          10
*
*hydro  fvcahs       jun
4231101 001000         9
*
*hydro  ebt                                                    vol
4231201  0          16870726.   1346447.   2412846. 0.     0.   1
4231202  0          16870266.   1313086.   2412857. 0.     0.   2
```

```
4231203  0          16869834.   1291594.   2412869. 0.     0.   3
4231204  0          16869406.   1277741.   2412880. 0.     0.   4
4231205  0          16868982.   1268703.   2412890. 0.     0.   5
4231206  0          16868558.   1262726.   2412901. 0.     0.   6
4231207  0          16868136.   1258717.   2412912. 0.     0.   7
4231208  0          16867716.   1255985.   2412923. 0.     0.   8
4231209  0          16867294.   1254092.   2412934. 0.     0.   9
4231210  0          16866852.   1252758.   2412945. 0.     0.   10
*                                                jun
4231301   .743488     .743488  0.                1 * .495016
4231302   .730293     .730293  0.                2 * .495016
4231303   .722359     .722359  0.                3 * .495016
4231304   .717338     .717338  0.                4 * .495016
4231305   .714162     .714162  0.                5 * .495016
4231306   .712103     .712103  0.                6 * .495016
4231307   .71074      .71074   0.                7 * .495016
4231308   .709819     .709819  0.                8 * .495016
4231309   .709185     .709185  0.                9 * .495016
*
*         diamj       beta    c       m        jun
4231401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 424 ******************************
* Steam generator 4 tubes row 4 (7 tubes)
*=====================================================================
4240000          sg4tub4          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
4240001   10
*
*hydro   vol area    vol
4240101   0.0009291   10
*
*hydro   jun area    jun
4240201   0.0          9
*
*hydro  length       vol
4240301  1.0656       10
*
*hydro   volume      vol
4240401   0.0         10
*
*hydro   horiz ang   vol
4240501   0.0         10
*
*hydro   vert angle  vol
4240601   0.0          1
4240602  -0.343        9
4240603   0.0         10
*
*hydro   delta z     vol
4240701  0.0           1
4240702 -0.006375      9
4240703  0.0          10
*
*hydro   roughness  hyd diam  vol
4240801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
4240901   0.047      0.047      9
*
*hydro   fe         vol
4241001  00          10
*
*hydro  fvcahs       jun
4241101 001000         9
*
```

```
*hydro  ebt                                                    vol
4241201  0          16867504.   1345236.   2412929. 0.     0.   1
4241202  0          1.6867+7    1312574.   2412941. 0.     0.   2
4241203  0          16866558.   1291422.   2412953. 0.     0.   3
4241204  0          16866104.   1277716.   2412965. 0.     0.   4
4241205  0          16865654.   1268726.   2412976. 0.     0.   5
4241206  0          16865204.   1262754.   2412988. 0.     0.   6
4241207  0          16864756.   1258729.   2.413+6  0.     0.   7
4241208  0          16864308.   1255975.   2413011. 0.     0.   8
4241209  0          16863862.   1254059.   2413022. 0.     0.   9
4241210  0          16863392.   1252705.   2413034. 0.     0.   10
*                                              jun
4241301   .763887     .763887  0.              1 * .508939
4241302   .750639     .750639  0.              2 * .508939
4241303   .742614     .742614  0.              3 * .508939
4241304   .737508     .737508  0.              4 * .508939
4241305   .73426      .73426   0.              5 * .508939
4241306   .732145     .732145  0.              6 * .508939
4241307   .730738     .730738  0.              7 * .508939
4241308   .729783     .729783  0.              8 * .508939
4241309   .729123     .729123  0.              9 * .508939
*
*         diamj       beta    c       m        jun
4241401   0.013       0.0     1.0     1.0       9
*
**************************** VOLUME 425 *****************************
* Steam generator tubes 4 row 5 (6 tubes)
*=====================================================================
4250000          sg4tub5          pipe
*---------------------------------------------------------------------------*
*
*hydro   no. volumes
4250001   10
*
*hydro   vol area    vol
4250101   0.0007964   10
*
*hydro   jun area    jun
4250201   0.0          9
*
*hydro  length       vol
4250301  1.0656       10
*
*hydro   volume      vol
4250401   0.0         10
*
*hydro   horiz ang   vol
4250501   0.0         10
*
*hydro   vert angle  vol
4250601   0.0          1
4250602  -0.343        9
4250603   0.0         10
*
*hydro   delta z     vol
4250701  0.0           1
4250702 -0.006375      9
4250703  0.0          10
*
*hydro   roughness  hyd diam  vol
4250801   5.00e-5     0.013    10
*
*hydro    Kfwd       Krev     jun
4250901   0.047      0.047      9
*
*hydro   fe         vol
4251001  00          10
*
```



```
*hydro  fvcahs       jun
4251101 001000         9
*
*hydro  ebt                                                    vol
4251201  0          16864410.   1343283.   2413008. 0.     0.   1
4251202  0          16863898.   1311556.   2413021. 0.     0.   2
4251203  0          16863414.   1290912.   2413034. 0.     0.   3
4251204  0          16862936.   1277468.   2413046. 0.     0.   4
4251205  0          16862460.   1268607.   2413058. 0.     0.   5
4251206  0          1.6862+7    1262692.   2413071. 0.     0.   6
4251207  0          16861514.   1258687.   2413083. 0.     0.   7
4251208  0          16861042.   1255935.   2413095. 0.     0.   8
4251209  0          16860570.   1254013.   2413107. 0.     0.   9
4251210  0          16860076.   1252648.   2413120. 0.     0.   10
*                                              jun
4251301   .782333     .782333  0.              1 * .447267
4251302   .769197     .769197  0.              2 * .447267
4251303   .761175     .761175  0.              3 * .447267
4251304   .756045     .756045  0.              4 * .447267
4251305   .752765     .752765  0.              5 * .447267
4251306   .750617     .750617  0.              6 * .447267
4251307   .749182     .749182  0.              7 * .447267
4251308   .748204     .748204  0.              8 * .447267
4251309   .747525     .747525  0.              9 * .447267
*
*         diamj       beta    c       m        jun
4251401   0.013       0.0     1.0     1.0       9
*
**************************** JUNCTION 428 ****************************
* junctions between the sg tubes and the cold collector
*=====================================================================
4280000        ccjuns4        mtpljun
*---------------------------------------------------------------------
4280001    5        0
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
4280011 425010000 429050003 0.0007964 0.005  0.002  001001  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
4280012 000000000 000000000   0         1
*
*  1nnm    velf         velg            #
4281011     .747046      .747046        1 * .447267
*
*  2nnm     Dhyd       b       c       m          #
4282011     0.013      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev   fvcahs   sub  2ph
4280021 424010000 429040003 0.0009291 0.005  0.002  001001  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
4280022  -1000000    -10000   0         5
*
*  1nnm    velf         velg            #
4281021     .728659      .728659        2 * .508939
4281031     .70874       .70874         3 * .495016
4281041     .689172      .689172        4 * .48134
4281051     .669286      .669286        5 * .467437
*
*  2nnm     Dhyd       b       c       m          #
4282021     0.013      1.0     2.0     1.0        5
*
**************************** VOLUME 429 *****************************
* Steam generator 4 cold collector
*=====================================================================
4290000          sg4cldc          pipe
*---------------------------------------------------------------------------*
*
*hydro   no. volumes
4290001   6
```

```
*
*hydro   vol area    vol
4290101   0.0          1
4290102   0.003632     5
4290103   0.0          6
*
*hydro   jun area    jun
4290201   0.0          5
*
*hydro  length       vol
4290301  0.508         1
4290302  0.476         4
4290303  0.429         5
4290304  0.051         6
*
*hydro   volume      vol
4290401   0.001883     1
4290402   0.0          5
4290403   0.0002164    6
*
*hydro   horiz ang   vol
4290501   0.0          6
*
*hydro   vert angle  vol
4290601  90.0          6
*
*hydro   delta z     vol
4290701  0.508         1
4290702  0.476         4
4290703  0.429         5
4290704  0.051         6
*
*hydro   roughness  hyd diam  vol
4290801   5.00e-5     0.068     5
4290802   5.00e-5     0.074     6
*
*hydro    Kfwd       Krev     jun
4290901   0.0        0.0        4
4290902   0.016      0.032      5
*
*hydro   fe         vol
4291001  00           6
*
*hydro  fvcahs       jun
4291101 001000         5
*
*hydro  ebt                                                 vol
4291201  0         16873760.   1252635.   2412767. 0.     0.    1
4291202  0         16870240.   1252616.   2412858. 0.     0.    2
4291203  0         16866810.   1252597.   2412946. 0.     0.    3
4291204  0         16863350.   1252581.   2413036. 0.     0.    4
4291205  0         16860030.   1252574.   2413121. 0.     0.    5
4291206  0         16858262.   1263401.   2413167. 0.     0.    6
*                                            jun
4291301   -.707761    -.707761 0.              1 * -1.932563
4291302   -.531478    -.531478 0.              2 * -1.451223
4291303   -.350188    -.350188 0.              3 * -.956207
4291304   -.1638013   -.1638013 0.             4 * -.447267
4291305   8.09745-11   8.11056-11  0.          5 * 2.211047-10
*
*         diamj       beta    c       m        jun
4291401   0.068       0.0     1.0     1.0       5
*
**************************** VOLUME 430 ******************************
* Steam generator 4 inlet transition region
*======================================================================
4300000   sgoutlt4      branch
*----------------------------------------------------------------------------*
*         no. juns  vel/flow
4300001   2         0
*         area                length          volume
4300101   0.0                 0.159           0.001069
*         azim angle          incl angle      delta z
4300102   0.0                -90.0           -0.159
*         roughness           hyd dia         pvbfe
4300103   5.00e-5             0.0             00000
*         ebt
4300200     0    16876314.  1252634. 2412702. 0.
*         from      to        area      Kf    Kr    fvcahs
4301101   429000000 430000000 0.004301 0.023  0.045 001000
4302101   430010000 435000000 0.004536 0.0    0.0   001000
*         velf       velg     veli
4301201   .742237    .742237    0. * 2.4
4302201   .703781    .703781    0. * 2.4
*         hyd dia   beta      y-int     slope
4301110   0.074     0.00      1.00      1.00
4302110   0.076     0.00      1.00      1.00
*
**************************** VOLUME 435 ******************************
* Loop 4 pump suction piping of cold leg
*======================================================================
4350000          pmpsct4          pipe
*----------------------------------------------------------------------------*
*
*hydro   no. volumes
4350001   14
*
*hydro   vol area    vol
4350101   0.004536    10
4350102   0.0         11
4350103   0.004536    14
*
*hydro   jun area    jun
4350201   0.004536    13
*
*hydro  length       vol
4350301  0.828         5
4350302  1.042         7
4350303  1.131         8
4350304  0.7495       10
4350305  0.74775      14
*
*hydro   volume      vol
4350401   0.0         10
4350402   0.006908    11
4350403   0.0         14
*
*hydro   horiz ang   vol
4350501  90.0          8
4350502 185.0         14
*
*hydro   vert angle  vol
4350601 -90.0          8
4350602   0.0         10
4350603  90.0         14
*
*hydro   delta z     vol
4350701 -0.828         5
4350702 -0.7425        7
4350703 -0.945         8
4350704  0.0          10
4350705  0.65175      11
4350706  0.74775      14
*
*hydro   roughness  hyd diam  vol
4350801   5.00e-5     0.076    14
```

```
*
*hydro    Kfwd       Krev     jun
4350901   0.0        0.0        4
4350902   0.13       0.13       5
4350903   0.0        0.0        6
4350904   0.13       0.13       7
4350905   0.25       0.25       8
4350906   0.0        0.0        9
4350907   0.25       0.25      10
4350908   0.0        0.0       13
*
*hydro   fe         vol
4351001  00          14
*
*hydro  fvcahs       jun
4351101 001000        13
*
*hydro  ebt                                                     vol
4351201  0          16879832.   1252492.   2412611. 0.     0.   1
4351202  0          16885898.   1252351.   2412455. 0.     0.   2
4351203  0          16891966.   1252209.   2412299. 0.     0.   3
4351204  0          16898034.   1252068.   2412143. 0.     0.   4
4351205  0          16904102.   1251926.   2411987. 0.     0.   5
4351206  0          16909828.   1251748.   2411840. 0.     0.   6
4351207  0          16915256.   1251570.   2411697. 0.     0.   7
4351208  0          16921406.   1251377.   2411514. 0.     0.   8
4351209  0          16924802.   1251249.   2411414. 0.     0.   9
4351210  0          16924768.   1251121.   2411415. 0.     0.   10
4351211  0          16922436.   1250925.   2411484. 0.     0.   11
4351212  0          16917110.   1250797.   2411642. 0.     0.   12
4351213  0          16911558.   1250670.   2411795. 0.     0.   13
4351214  0          1.6906+7    1250542.   2411938. 0.     0.   14
*                                              jun
4351301   .703731     .703731  0.             1 * 2.4
4351302   .703679     .703679  0.             2 * 2.4
4351303   .703627     .703627  0.             3 * 2.4
4351304   .703575     .703575  0.             4 * 2.4
4351305   .703523     .703523  0.             5 * 2.4
4351306   .703459     .703459  0.             6 * 2.4
4351307   .703395     .703395  0.             7 * 2.4
4351308   .703326     .703326  0.             8 * 2.4
4351309   .703281     .703281  0.             9 * 2.4
4351310   .703239     .703239  0.             10 * 2.4
4351311   .703176     .703176  0.             11 * 2.4
4351312   .703139     .703139  0.             12 * 2.4
4351313   .703102     .703102  0.             13 * 2.4
*
*         diamj       beta    c       m        jun
4351401   0.076       0.0     1.0     1.0      13
*
**********************************  VOLUME 440  ******************************
* Loop 4 primary coolant pump
*
*=====================================================================
4400000   mcp4        pump
*----------------------------------------------------------------------------*
*         area                length          volume
4400101   0.0                 0.746           0.010
*         azim angle     incl angle      delta z   pvbfe
4400102   0.0            30.0            0.370     00000
*         from      jun area  Kf    Kr    efvcahs
4400108   435010000 0.004536  0.0   0.0   0001000
*         to        jun area  Kf    Kr    efvcahs
4400109   442000000 0.004536  0.0   0.0   0001000
*         hyd dia   beta      y-int     slope
4400110   0.076     0.00      1.00      1.00
4400111   0.076     0.00      1.00      1.00
*         ebt
```

```
4400200     0    16907078.  1244497. 2411910. 0.
*         vel/flow  liquid    vapor     int-face
4400201   0         .703064   .703064   0. * 2.4
4400202   0         .701086   .701086   0. * 2.4
*         tabdat-i  2ph-i  2phdiff-i torque-i  pvel-i  trip  rev-i
4400301   -2        -1     -3        -1        0       1440  1
*         rated vel  in/rated vel  rated flow  rated head
4400302   314.2      .1287575      0.022       100.
*         rated torq   mom-iner  rated dens  rated m-torq
4400303   57.2         5.0-2     750.0       0.00
*         coeff-tf2  coeff-tf0  coeff-tf1  coeff-tf3
4400304   0.57       0.57       0.0       0.0
*
*hydro        trip no.          parameter no.
4406100        440            cntrlvar  440
*
*hydro        indp var          speed (rad/s)
4406101        -1.0             314.2
4406102         0.0                0.
4406103       500.0              500.
*
***************************** VOLUME 442 *****************************
* Piping from pump discharge to isolation valve
*==================================================================$
*hydro             component name      component type
4420000               pmp4out             snglvol
*------------------------------------------------------------------$
*hydro            area               length              volume
4420101           0.004536           0.880               0.0
*
*hydro         horz angle          vert angle           delta z
4420102         -10.0                0.0                  0.0
*
*hydro          roughness           hyd diam              fe
4420103          0.00005            0.076                 00
*
*hydro  ebt pressure     tempe
4420200   0    16910580.  1244262. 2411820. 0.
*
**************************** JUNCTION 443 ****************************
* Cold leg isolation valve
*=================================================================$
4430000                cl4vlv        valve
*------------------------------------------------------------------
*
*hydro    from          to            area     kf    kr     vcahs
4430101   442010000     445000000    0.004536 0.0    0.0    00100
*
4430201   0        .701004 .701004 0. * 2.4
*
4430300   mtrvlv
*
*         open  close  rate  ic
4430301   442   443    0.1   1.
*
**************************** VOLUME 445 *****************************
* Loop 4 reactor vessel inlet section of cold leg
*====================================================================
4450000          cldleg4          pipe
*------------------------------------------------------------------------*
*
*hydro   no. volumes
4450001   4
*
*hydro   vol area    vol
4450101   0.004536     4
*
*hydro   jun area    jun
```

```
4450201   0.004536     3
*
*hydro  length       vol
4450301  0.782         3
4450302  0.741         4
*
*hydro   volume      vol
4450401   0.0          4
*
*hydro   horiz ang   vol
4450501  -10.0         3
4450502  -55.0         4
*
*hydro   vert angle  vol
4450601   0.0          4
*
*hydro   delta z     vol
4450701   0.0          4
*
*hydro   roughness  hyd diam  vol
4450801   5.00e-5     0.076     4
*
*hydro    Kfwd       Krev     jun
4450901   0.0        0.0       2
4450902   0.16       0.16      3
*
*hydro   fe         vol
4451001  00           4
*
*hydro  fvcahs       jun
4451101 001000         3
*
*hydro  ebt                                                  vol
4451201  0          16910542.   1244129.   2411821. 0.     0.    1
4451202  0          16910506.   1243996.   2411822. 0.     0.    2
4451203  0          16910470.   1243737.   2411823. 0.     0.    3
4451204  0          16910406.   1243737.   2411825. 0.     0.    4
*                                              jun
4451301   .700959     .700959  0.               1 * 2.4
4451302   .700915     .700915  0.               2 * 2.4
4451303   .700828     .700828  0.               3 * 2.4
*
*         diamj       beta    c       m        jun
4451401   0.076       0.0     1.0     1.0       3
*
*########################################################################
*                            LOOP 4                                     $
*                      SECONDARY COOLANT SYSTEM                         $
*########################################################################
**************************** VOLUME 450 ******************************
* Loop 4 Main Feedwater source
*======================================================================
4500000   mfw4src   tmdpvol
*---------------------------------------------------------------------*
*         area                length          volume
4500101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
4500102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
4500103   0.00000             0.0000          00010
*         ebt       trip          search var
4500200   003       0
*         indep var
4500201   0.00     10.0e6     443.15
*
**************************** JUNCTION 451 ****************************
* Loop 4 main feedwater flow
*======================================================================
```

```
4510000   mfw4      tmdpjun
*
*         From      To        Area
4510101   450010000 459000000 0.0009079
*
*        vel/Kg     trip      var req.  # var req
4510200   1         451                                 * trancalc
*
*         Time    kg/s      kg/s      m/s
4510201    0.0    0.1739    0.        0.                * trancalc
4510202    4.0    0.1739    0.        0.                * trancalc
4510203    5.0    0.0       0.        0.                * trancalc
*
**************************** VOLUME 455 ******************************
* Loop 4 Auxiliary Feedwater source
*======================================================================
4550000   afw4src  tmdpvol
*---------------------------------------------------------------------*
*         area                length          volume
4550101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
4550102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
4550103   0.00000             0.0000          00010
*         ebt       trip          search var
4550200   003       0
*         indep var
4550201   0.00     16.0e6     443.15
*
**************************** JUNCTION 456 ****************************
* Loop 4 auxiliary feedwater flow
*======================================================================
4560000   afw4      tmdpjun
*
*         From      To        Area
4560101   455010000 459000000 0.0009079
*
*        vel/Kg     trip      var req.  # var req
4560200   1         456
*
*         Time    kg/s      kg/s      m/s
4560201   -1.     0.0       0.        0.
4560202    0.0    0.0       0.        0.
*
**************************** VOLUME 459 ******************************
* Loop 4 Feedwater ring
*======================================================================
4590000   fwring4    branch
*------------------------------------------------------------------------------
*         no. juns  vel/flow
4590001   1         0
*         area                length          volume
4590101   0.0009079           1.062           0.0
*         azim angle          incl angle      delta z
4590102   0.0                   0.0            0.000
*         roughness           hyd dia         pvbfe
4590103   5.0e-5              0.034           00000
*         ebt
4590200     0    7174709.   1072984. 2580103. .384723
*         from      to        area      Kf    Kr    fvcahs
4591101   459010000 472010003 0.009651 0.0    0.0   001000
*         velf       velg     veli
4591201   .0435144   -.1533847  0.   * .1738763
*         hyd dia   beta      y-int     slope
4591110   0.008     0.00      1.00      1.00
*
**********************************************************************
* These components have been superseded.  They are being left in the
```

```
* input deck for possible future use.
**********************************************************************
*
**************************** VOLUME 460 ******************************
* Loop 4 sg downcomer
*=====================================================================
$4600000            dc4           annulus
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
$4600001    5
*
*hydro   vol area    vol
$4600101   0.0         5
*
*hydro   jun area    jun
$4600201   0.0         4
*
*hydro  length       vol
$4600301  0.374        1
$4600302  0.476        4
$4600303  0.563        5
*
*hydro   volume      vol
$4600401   0.00987      1
$4600402   0.01256      4
$4600403   0.01486      5
*
*hydro   vert angle  vol
$4600601  -90.0        5
*
*hydro   delta z     vol
$4600701  -0.374       1
$4600702  -0.476       4
$4600703  -0.563       5
*
*hydro   roughness  hyd diam  vol
$4600801   1.0e-5      0.04      5
*
*hydro    Kfwd       Krev     jun
$4600901   0.0        0.0        4
*
*hydro   fe         vol
$4601001  00          5
*
*hydro  fvcahs       jun
$4601101 001000        4
*
*hydro  ebt                                                  vol
$4601201  2          7.40e6      0.0        0.     0.       0.    5
*                                              jun
$4601301   0.0        0.0      0.0            4
*          diamj       beta    c       m        jun
$4601401   0.04        0.0     1.0     1.0       4
*
**************************** JUNCTION 465 *****************************
* Loop 4 sg downcomer-to-riser connection
*=====================================================================
$4650000   dcrisr4   mtpljun
*----------------------------------------------------------------------
$4650001    5       0
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$4650011 460050003 470010004 0.3694    0.2   0.2    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$4650012 000000000 000000000   0         1
*
*  1nnm    velf        velg           #
$4651011     0.0         0.0           1
*
*  2nnm     Dhyd       b       c       m          #
$4652011     0.032      1.0     2.0     1.0        1
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$4650021 460040003 470020004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$4650022 000000000 000000000   0         2
*
*  1nnm    velf        velg           #
$4651021     0.0         0.0           2
*
*  2nnm     Dhyd       b       c       m          #
$4652021     0.032      1.0     2.0     1.0        2
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$4650031 460030003 470030004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$4650032 000000000 000000000   0         3
*
*  1nnm    velf        velg           #
$4651031     0.0         0.0           3
*
*  2nnm     Dhyd       b       c       m          #
$4652031     0.032      1.0     2.0     1.0        3
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$4650041 460020003 470040004 0.2815    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$4650042 000000000 000000000   0         4
*
*  1nnm    velf        velg           #
$4651041     0.0         0.0           4
*
*  2nnm     Dhyd       b       c       m          #
$4652041     0.032      1.0     2.0     1.0        4
*
*  0nnm  from      to        area     kfor  krev   fvcahs  sub  2ph
$4650051 460010003 470050004 0.2413    5.0   5.0    001003  1.0  1.0 1.0
*         inc-frm    inc-to   0         limit
$4650052 000000000 000000000   0         5
*
*  1nnm    velf        velg           #
$4651051     0.0         0.0           5
*
*  2nnm     Dhyd       b       c       m          #
$4652051     0.032      1.0     2.0     1.0        5
*
**************************** VOLUME 470 ******************************
* Loop 4 sg riser
*=====================================================================
$4700000         riser4          annulus
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
$4700001    5
*
*hydro   vol area    vol
$4700101   0.0         5
*
*hydro   jun area    jun
$4700201   0.0         4
*
*hydro  length       vol
$4700301  0.563        1
$4700302  0.476        4
$4700303  0.374        5
```

```
*
*hydro   volume      vol
$4700401   0.04553      1
$4700402   0.03701      4
$4700403   0.02902      5
*
*hydro   vert angle  vol
$4700601   90.0         5
*
*hydro   delta z     vol
$4700701   0.563        1
$4700702   0.476        4
$4700703   0.374        5
*
*hydro   roughness  hyd diam  vol
$4700801   1.0e-5      0.0376    5
*
*hydro    Kfwd       Krev     jun
$4700901   0.0        0.0        4
*
*hydro   fe         vol
$4701001  00          5
*
*hydro  fvcahs       jun
$4701101 001000         4
*
*hydro  ebt                                                    vol
$4701201  2          7.40e6      0.0        0.     0.       0.    5
*                                                jun
$4701301   0.0         0.0      0.0             4
*         diamj       beta    c       m        jun
$4701401   0.0376      0.0     1.0     1.0       4
*
**************************** VOLUME 472 ******************************
* Loop 4 sg lower steam dome
*==============================================================================*
$4720000   lwrdom4    branch
*------------------------------------------------------------------------------*
*         no. juns  vel/flow
$4720001   3         0
*         area                length          volume
$4720101   0.0                 0.630           0.09265
*         azim angle          incl angle      delta z
$4720102     0.                90.0            0.630
*         roughness           hyd dia         pvbfe
$4720103   5.0e-5              0.343           01000
*         ebt
$4720200     2    7.40e6      1.0
*         from      to        area      Kf    Kr    fvcahs
$4721101   470010000 472000000 0.07778   0.24  0.24  101000
$4722101   472010000 475000000 0.1521    0.0   0.0   001000
$4723101   472000000 460000000 0.02639   0.41  0.68  101000
*         velf       velg     veli
$4721201   0.0        0.0        0.   * 0.0
$4722201   0.0        0.0        0.   * 0.0
$4723201   0.0        0.0        0.   * 0.0
*         hyd dia   beta      y-int     slope
$4721110   0.0376    1.00      1.00      1.00
$4722110   0.0       0.00      1.00      1.00
$4723110   0.04      0.00      1.00      1.00
*
**********************************************************************
* End of superseded components
**********************************************************************
*
**************************** VOLUME 470 ******************************
* Loop 4 sg riser
*======================================================================
```

```
4700000         riser4           annulus
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
4700001    5
*
*hydro   vol area    vol
4700101   0.0         5
*
*hydro   jun area    jun
4700201   0.0         4
*
*hydro  length      vol
4700301  0.563        1
4700302  0.476        4
4700303  0.374        5
*
*hydro   volume      vol
4700401   0.06039      1
4700402   0.04957      4
4700403   0.03896      5
*
*hydro   vert angle  vol
4700601   90.0        5
*
*hydro   delta z     vol
4700701   0.563       1
4700702   0.476       4
4700703   0.374       5
*
*hydro   roughness  hyd diam  vol
4700801   1.0e-5     0.0378    5
*
*hydro    Kfwd       Krev     jun
4700901   0.0        0.0       4
*
*hydro   fe         vol
4701001  00          5
*
*hydro  fvcahs       jun
4701101 001000        4
*
*hydro  ebt                                                   vol
4701201  0         7188555.    1267182.   2579963. .0651258 0.  1
4701202  0         7185127.    1267083.   2.58+6   .12224   0.  2
4701203  0         7182162.    1266950.   2580030. .1683744 0.  3
4701204  0         7179382.    1266823.   2580059. .235899  0.  4
4701205  0         7176834.    1266443.   2580086. .1075324 0.  5
*                                             jun
4701301   -7.27712-4  .1909855 0.              1 * -2.575355-4
4701302   -.001552657 .2051773 0.              2 * -8.23632-4
4701303   -.00255735  .224915  0.              3 * -.001661317
4701304   -.00294158  .2149632 0.              4 * -.00301508
*         diamj       beta    c       m        jun
4701401   0.0376      0.0     1.0     1.0       4
*
**************************** VOLUME 472 ******************************
* Loop 4 sg lower steam dome
*==============================================================================*
4720000   lwrdom4    branch
*------------------------------------------------------------------------------*
*         no. juns  vel/flow
4720001   2         0
*         area                length          volume
4720101   0.0                 0.630           0.09265
*         azim angle          incl angle      delta z
4720102     0.                90.0            0.630
*         roughness           hyd dia         pvbfe
```

```
4720103   5.0e-5              0.343           01000
*         ebt
4720200     0    7174655.    1252518. 2580086. .60982
*         from      to        area      Kf    Kr    fvcahs
4721101   470010000 472000000 0.10417   0.10  0.16  101000
4722101   472010000 475000000 0.1521    0.0   0.0   001000
*         velf       velg     veli
4721201   -.00802961 .5679      0.   * -.00328567
4722201   -.624268   .0502047   0.   * .1731445
*         hyd dia   beta      y-int     slope
4721110   0.0376    1.00      1.00      1.00
4722110   0.0       0.00      1.00      1.00
*
**************************** VOLUME 475 ******************************
* Loop 4 sg upper portion of steam dome
*=====================================================================
4750000        uprdom4            pipe
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
4750001    2
*
*hydro   vol area    vol
4750101   0.1521       2
*
*hydro   jun area    jun
4750201   0.0          1
*
*hydro  length       vol
4750301  0.470         2
*
*hydro   volume      vol
4750401   0.0          2
*
*hydro   vert angle  vol
4750601   90.0         2
*
*hydro   delta z     vol
4750701   0.470        2
*
*hydro   roughness  hyd diam  vol
4750801   1.0e-5      0.440     2
*
*hydro    Kfwd       Krev     jun
4750901   0.0        0.0       1
*
*hydro   fe         vol
4751001  00           2
*
*hydro  fvcahs       jun
4751101 001000         1
*
*hydro  ebt                                                        vol
4751201  0          7173604.    1266599.   2580109. .999975 0.   1
4751202  0          7173431.    1266590.   2580119. .999947 0.   2
*                                              jun
4751301   -.1486163   .0303694  0.             1 * .1725543
*         diamj       beta    c       m        jun
4751401   0.0161      0.0     1.0     1.0       1
*
**************************** VOLUME 480 ******************************
* Steam line 4
*=====================================================================
4800000   stmlin4    branch
*------------------------------------------------------------------------------
*         no. juns  vel/flow
4800001   1         0
*         area                length          volume
4800101   0.0003142           4.74            0.0
*         azim angle          incl angle      delta z
4800102   0.0                   0.0             0.0
*         roughness           hyd dia         pvbfe
4800103   5.0e-5              0.020           00000
*         ebt
4800200     0    7161856.    1266024. 2580355. .99995
*         from      to        area       Kf     Kr    fvcahs
4801101   475020004 480000000 0.0003142  0.0    0.0   001101
*         velf       velg     veli
4801201   14.51316   14.56896   0.   * .172048
*         hyd dia   beta      y-int     slope
4801110   0.020     0.00      1.00      1.00
*
**************************** JUNCTION 481 ****************************
* Steam Line 4 Relief Valve
*====================================================================$
4810000           relief4        valve
*--------------------------------------------------------------------
*
*hydro    from          to            area      kf    kr     vcahs
4810101   480010003     482000000     0.0003142 0.0   0.0    00102
*
*         hyd dia   beta      y-int     slope
4810110   0.020     0.00      1.00      1.00
*
*         ic     velf       velg     veli
4810201   0      0.         0.       0. * 0.
*
4810300   trpvlv
4810301    1481
*
**************************** VOLUME  482 *****************************
* Atmospheric boundary condition for steam relief
*====================================================================*
4820000   atmos4   tmdpvol
*--------------------------------------------------------------------*
*         area                length          volume
4820101   1.0                  1.0              0.0
*         azim angle          incl angle      delta z
4820102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
4820103   0.00000             0.0000          00010
*         ebt       trip          search var
4820200   003       0
*         indep var
4820201   0.00     1.013e5    300.0
*
**************************** JUNCTION 485 ****************************
* Steam Line 4 Isolation Valve
*====================================================================$
4850000                isolv4        valve
*--------------------------------------------------------------------
*
*hydro    from          to            area      kf    kr     vcahs
4850101   480010000     700040003     0.0003142 0.0   0.0    01101
*
*         hyd dia   beta      y-int     slope
4850110   0.020     0.00      1.00      1.00
*
*         ic     velf       velg     veli
4850201   0      14.54942   14.59837 0. * .1720456
*
4850300   mtrvlv
*
*         open  close  rate       ic
4850301    485   484   0.055556   1.     * 18 s closing time
*
```

```
*#######################################################################
*                       PRESSURIZER                                   $
*#######################################################################
*==============================================================================*
5010000   sl2v1     branch
*------------------------------------------------------------------------------
*         no. juns  vel/flow
5010001   1         0
*         area         length        volume
5010101   0.0          1.126         0.001841
*         azim angle          incl angle      delta z
5010102   -135.0              -62.8           -1.001
*         roughness           hyd dia       tlpvbfe
5010103   5.0e-5              0.043         0000000
*         ebt
5010200     0    16895648.  1056774. 2412204. 0.
*         from      to        area      Kf    Kr   efvcahs
5011101   201040005 501000000 0.003318 3.04  2.88  0000002
*         velf       velg     veli
5011201   6.21881-10 6.21852-10 0. * 1.430373-9
*         hyd dia   beta      y-int     slope
5011110   0.065     0.00      1.00      1.00
*
**************************** JUNCTION 503 ****************************
* Surge Line 2 Isolation Valve
*====================================================================$
5030000               sl2iv         valve
*---------------------------------------------------------------------
*
*hydro    from       to          area      kf    kr   efvcahs
5030101   501010000  505000000   0.001452  0.0   0.0  0000100
*
*         hyd dia   beta      y-int     slope
5030110   0.043     0.00      1.00      1.00
*
*         ic     velf       velg     veli
5030201   0      0.         0.       0. * 0.
*
5030300   mtrvlv
*
*          open  close rate  init
5030301    502   503   0.1   0.
*
*==============================================================================*
5050000           sl2v2              pipe
*------------------------------------------------------------------------------*
*hydro   no. volumes
5050001   7
*
*hydro   vol area    vol
5050101   0.001452     7
*
*hydro  length       vol
5050301  0.876         1
5050302  0.662         2
5050303  0.940         6
5050304  1.031         7
*
*hydro   volume      vol
5050401   0.0          7
*
*hydro   horz angle  vol
5050501    0.0         1
5050502   90.0         2
5050503    0.0         6
5050504  180.0         7
*
*hydro   vert angle  vol
5050601  -90.0         1
5050602    0.0         2
5050603  -90.0         6
5050604    0.0         7
*
*hydro   delta z     vol
5050701  -0.876        1
5050702   0.0          2
5050703  -0.940        6
5050704   0.0          7
*
*hydro   roughness  hyd diam  vol
5050801   5.0e-5     0.043     7
*
*hydro    Kfwd       Krev     jun
5050901   0.41       0.41       2
5050902   0.0        0.0        5
5050903   0.41       0.41       6
*
*hydro   fe         vol
5051001  00          7
*
*hydro  efvcahs       jun
5051101 0001000         6
*
*hydro  ebt                                                    vol
5051201  0         16902054.   1034369.   2412039. 0.     0.    1
5051202  0         16905588.   1033834.   2411949. 0.     0.    2
5051203  0         16909380.   1034409.   2411851. 0.     0.    3
5051204  0         16916964.   1034404.   2411646. 0.     0.    4
5051205  0         16924548.   1034392.   2411421. 0.     0.    5
5051206  0         16932132.   1034510.   2411196. 0.     0.    6
5051207  0         16935924.   1038704.   2411084. 0.     0.    7
*                                              jun
5051301   -8.75664-10 -8.93957-10 0.           1 * -1.046303-9
5051302   -1.536887-9 -1.55746-9  0.           2 * -1.836004-9
5051303   -2.4766-9   -2.47672-9 0.            3 * -2.95863-9
5051304   -3.41624-9  -3.416365-9 0.           4 * -4.081205-9
5051305   -4.35588-9  -4.356-9    0.           5 * -5.20355-9
5051306   -5.29867-9  -5.314-9    0.           6 * -6.32025-9
*         diamj       beta    c       m        jun
5051401   0.043       0.0     1.0     1.0       6
*
*==============================================================================*
5110000   sl4v1     branch
*------------------------------------------------------------------------------
*         no. juns  vel/flow
5110001   1         0
*         area         length        volume
5110101   0.0          1.345         0.002150
*         azim angle          incl angle      delta z
5110102     45.0              -60.5           -1.171
*         roughness           hyd dia       tlpvbfe
5110103   5.0e-5              0.043         0000000
*         ebt
5110200     0    16896040.  1197302. 2412194. 0.
*         from      to        area      Kf    Kr   efvcahs
5111101   401040005 511000000 0.003318 3.04  2.88  0000002
*         velf       velg     veli
5111201   4.95623-7   4.95625-7  0. * 1.139956-6
*         hyd dia   beta      y-int     slope
5111110   0.065     0.00      1.00      1.00
*
**************************** JUNCTION 513 ****************************
* Surge Line 4 Isolation Valve
*====================================================================$
5130000               sl4iv         valve
*---------------------------------------------------------------------
```

```
*
*hydro    from       to          area      kf    kr   efvcahs
5130101   511010000  515000000   0.001452  0.0   0.0  0000100
*
*         hyd dia   beta      y-int     slope
5130110   0.043     0.00      1.00      1.00
*
*         ic     velf       velg     veli
5130201   0      1.076185-6 1.076198-6 0. * 1.204916-6
*
5130300   mtrvlv
*
*          open  close rate  init
5130301    512   513   0.1   1.
*
*=============================================================================*
5150000            sl4v2              pipe
*-----------------------------------------------------------------------------*
*hydro   no. volumes
5150001   6
*
*hydro   vol area    vol
5150101   0.001452     6
*
*hydro  length       vol
5150301  1.338         2
5150302  1.321         4
5150303  1.790         5
5150304  1.091         6
*
*hydro   volume      vol
5150401   0.0         6
*
*hydro   horz angle  vol
5150501    0.0        2
5150502  -90.0        4
5150503    0.0        6
*
*hydro   vert angle  vol
5150601  -90.0        2
5150602    0.0        4
5150603  -90.0        5
5150604    0.0        6
*
*hydro   delta z     vol
5150701  -1.338       2
5150702   0.0         4
5150703  -1.790       5
5150704   0.0         6
*
*hydro   roughness  hyd diam  vol
5150801   5.0e-5     0.043     6
*
*hydro    Kfwd       Krev     jun
5150901   0.0        0.0       1
5150902   0.41       0.41      2
5150903   0.0        0.0       3
5150904   0.41       0.41      5
*
*hydro   fe         vol
5151001  00           6
*
*hydro  efvcahs       jun
5151101 0001000         5
*
*hydro  ebt                                                  vol
5151201  0         16905716.   1108657.   2411945. 0.     0.    1
5151202  0         16916284.   1074555.   2411666. 0.     0.    2
5151203  0         16921602.   1059103.   2411509. 0.     0.    3
5151204  0         16921602.   1052542.   2411509. 0.     0.    4
5151205  0         16928764.   1057461.   2411296. 0.     0.    5
5151206  0         16935924.   1090671.   2411084. 0.     0.    6
*                                              jun
5151301   1.058144-6  1.058156-6 0.           1 * 1.229286-6
5151302   1.051243-6  1.051226-6  0.          2 * 1.237432-6
5151303   1.047552-6  1.047552-6  0.          3 * 1.24021-6
5151304   1.045226-6  1.045207-6  0.          4 * 1.240434-6
5151305   1.043977-6  1.043957-6  0.          5 * 1.236732-6
*         diamj       beta    c       m       jun
5151401   0.043       0.0     1.0     1.0       5
*
*=============================================================================*
5200000   slcomlo   branch
*-----------------------------------------------------------------------------
*         no. juns  vel/flow
5200001   2         0
*         area         length        volume
5200101   0.001452     1.227         0.0
*         azim angle          incl angle      delta z
5200102    -90.0               45.0            0.867
*         roughness           hyd dia       tlpvbfe
5200103   5.0e-5              0.043         0000000
*         ebt
5200200     0    16932584.  1153015. 2411183. 0.
*         from      to        area        Kf    Kr   efvcahs
5201101   505010000 520000000 0.001452   0.72  1.10  0001000
5202101   515010000 520000000 0.001452   0.72  1.10  0001000
*         velf       velg     veli
5201201   -6.4582-9   -6.44537-9  0. * -7.36953-9
5202201   1.047477-6  1.047489-6  0. * 1.225452-6
*         hyd dia   beta      y-int     slope
5201110   0.043     0.00      1.00      1.00
5202110   0.043     0.00      1.00      1.00
*
*=============================================================================*
5250000   slcomhi   branch
*-----------------------------------------------------------------------------
*         no. juns  vel/flow
5250001   2         0
*         area         length        volume
5250101   0.0006158    0.843         0.0
*         azim angle          incl angle      delta z
5250102      0.0               90.0            0.843
*         roughness           hyd dia       tlpvbfe
5250103   5.0e-5              0.028         0000000
*         ebt
5250200     0    16925606.  824717.  2411390. 0.
*         from      to        area        Kf    Kr   efvcahs
5251101   520010000 525000000 0.0006158  0.133 0.170 0001000
5252101   525010000 530000000 0.0006158  0.94  0.49  0000000
*         velf       velg     veli
5251201   2.472455-6  2.472516-6  0. * 1.196547-6
5252201   -2.82218-5 -2.823047-5 0. * -1.296026-5
*         hyd dia   beta      y-int     slope
5251110   0.028     0.00      1.00      1.00
5252110   0.028     0.00      1.00      1.00
*
$*============================================================================
$5300000   pzrhtri   branch
$*----------------------------------------------------------------------------
$*         no. juns  vel/flow
$5300001   1         0
$*         area         length        volume
$5300101   0.0          0.719         0.0002161
$*         azim angle          incl angle      delta z
$5300102      0.0               90.0            0.719
```

```
$*         roughness           hyd dia       tlpvbfe
$5300103   5.0e-5              0.020         0000000
$*         ebt
$5300200     3    15.7e6     563.15
$*         from      to        area        Kf    Kr   efvcahs
$5301101   530010000 535000000 0.00001257 1.71  1.65  0000000
$*         velf       velg     veli
$5301201   0.0        0.0        0.
$*         hyd dia   beta      y-int     slope
$5301110   0.004     0.00      1.00      1.00
$*
$*===============================================================================
$5320000   pzrhtra   branch
$*-------------------------------------------------------------------------------
$*         no. juns  vel/flow
$5320001   2         0
$*         area         length        volume
$5320101   0.0          0.719         0.0009219
$*         azim angle          incl angle      delta z
$5320102     0.0                90.0            0.719
$*         roughness           hyd dia       tlpvbfe
$5320103   5.0e-5              0.044         0000000
$*         ebt
$5320200     3    15.7e6     563.15
$*         from      to        area        Kf    Kr   efvcahs
$5321101   530010004 532010003 0.001608   1.5   1.5   0001000
$5322101   532010000 535000000 0.00005027 1.71  1.65  0000000
$*         velf       velg     veli
$5321201   0.0        0.0        0.
$5322201   0.0        0.0        0.
$*         hyd dia   beta      y-int     slope
$5321110   0.008     0.00      1.00      1.00
$5322110   0.004     0.00      1.00      1.00
$*
$*===============================================================================
$5340000   pzrlowa   branch
$*-------------------------------------------------------------------------------
$*         no. juns  vel/flow
$5340001   2         0
$*         area         length        volume
$5340101   0.0          0.719         0.013233
$*         azim angle          incl angle      delta z
$5340102     0.0                90.0            0.719
$*         roughness           hyd dia       tlpvbfe
$5340103   5.0e-5              0.107         0000000
$*         ebt
$5340200     3    15.7e6     563.15
$*         from      to        area        Kf    Kr   efvcahs
$5341101   532010004 534010003 0.032464   1.0   0.5   0001000
$5342101   534010000 535000000 0.01840    0.014 0.059 0001000
$*         velf       velg     veli
$5341201   0.0        0.0        0.
$5342201   0.0        0.0        0.
$*         hyd dia   beta      y-int     slope
$5341110   0.0278    0.00      1.00      1.00
$5342110   0.107     0.00      1.00      1.00
$*
*==============================================================================*
5300000            pzrbody            pipe
*------------------------------------------------------------------------------*
*hydro   no. volumes
5300001   8
*
*hydro   vol area    vol
5300101   0.0          1
5300102   0.02087      8
*
*hydro  length       vol
5300301  1.450        1
5300302  1.373        8
*
*hydro   volume      vol
5300401   0.02787      1
5300402   0.0          8
*
*hydro   horz angle  vol
5300501    0.0        8
*
*hydro   vert angle  vol
5300601   90.0        8
*
*hydro   delta z     vol
5300701  1.450        1
5300702  1.373        8
*
*hydro   roughness  hyd diam  vol
5300801   5.0e-5     0.163     8
*
*hydro    Kfwd       Krev     jun
5300901   0.0        0.0       7
*
*hydro   fe         vol
5301001  00          8
*
*hydro  efvcahs       jun
5301101 0001000        7
*
*hydro  ebt                                                    vol
5301201  3          16916666.   623.       0.       0.     0.   1
5301202  3          16906274.   623.       0.       0.     0.   2
5301203  3          16896104.   623.       0.       0.     0.   3
5301204  3          16886058.   623.       0.       0.     0.   4
5301205  3          16876340.   623.       0.       0.     0.   5
5301206  3          16867080.   623.       0.       0.     0.   6
5301207  0          16860504.   1631641.   2413200. .592857 0.   7
5301208  0          16857644.   1656015.   2413183. .999545 0.   8
*                                              jun
5301301   -1.519326-4 -1.521815-4 0.           1 * -.002208055
5301302   -1.612998-4 -1.6158-4   0.           2 * -.002540264
5301303   -1.832503-4 -1.836116-4 0.           3 * -.00282085
5301304   -2.08966-4  -2.094353-4 0.           4 * -.00307819
5301305   -2.42367-4  -2.429966-4 0.           5 * -.003387033
5301306   -7.21931-4  .567705  0.              6 * -.00357583
5301307   -.4625345   -4.39312-4 0.            7 * -.003570934
*          diamj       beta    c       m       jun
5301401   0.163       0.0     1.0     1.0       7
*
*==============================================================================*
5350000   pzrhead   branch
*-------------------------------------------------------------------------------
*          no. juns  vel/flow
5350001   1         0
*          area         length        volume
5350101   0.0          1.602         0.03130
*          azim angle          incl angle      delta z
5350102     0.0                90.0            1.602
*          roughness           hyd dia       tlpvbfe
5350103   5.0e-5              0.163         0000000
*          ebt
5350200     0    16855926.  1655951. 2413227. .999539
*          from      to        area        Kf    Kr   efvcahs
5351101   530010000 535000000 0.02087    0.0   0.0   0001000
*          velf       velg     veli
5351201   -.2394845  -9.21545-4  0. * -.00357094
*          hyd dia   beta      y-int     slope
5351110   0.163     0.00      1.00      1.00
```

```
*
*===============================================================================*
5720000   pzrsrvln  branch
*-------------------------------------------------------------------------------
*         no. juns  vel/flow
5720001   1         0
*         area         length        volume
5720101   0.0002270    1.0           0.0
*         azim angle          incl angle      delta z
5720102      0.0                0.0             0.0
*         roughness           hyd dia       tlpvbfe
5720103   5.0e-5              0.017         0000000
*         ebt
5720200     0    16855926.  1655951. 2418339. 1.
*         from      to        area        Kf    Kr   efvcahs
5721101   535010004 572010001 0.0002270  0.5   1.0   0001002
*         velf       velg     veli
5721201   -2.70704-10  -5.55891-15 0. * -1.46557-16
*         hyd dia   beta      y-int     slope
5721110   0.017     0.00      1.00      1.00
*
* pressurizer relief valve
*======================================================================$
5750000                pzrsrv        valve
*----------------------------------------------------------------------
*
*hydro    from       to          area      kf    kr   efvcahs
5750101   572010000  578000000   0.0002270 0.0   0.0  0000100
*
*         hyd dia   beta      y-int     slope
5750110   0.017     0.00      1.00      1.00
*
*         ic     velf       velg     veli
5750201   0      0.         0.       0. * 0.
*
5750300   mtrvlv
*
*         open  close rate  init
5750301   1573  1575   2.0   0.
*
*======================================================================*
5780000   pzrrvatm tmdpvol
*----------------------------------------------------------------------*
*         area                length          volume
5780101   0.0002270             1.0             0.0
*         azim angle          incl angle      delta z
5780102   0.00                 0.0              0.0
*         roughness           hyd dia       tlpvbfe
5780103   0.00000             0.017         0000010
*         ebt       trip          search var
5780200   004       0
*         indep var
5780201   0.00     1.0e5    300.0   1.0
*
*===============================================================================*
5820000   pzrporvl  branch
*-------------------------------------------------------------------------------
*         no. juns  vel/flow
5820001   1         0
*         area         length        volume
5820101   0.0003801    1.0           0.0
*         azim angle          incl angle      delta z
5820102      0.0                0.0             0.0
*         roughness           hyd dia       tlpvbfe
5820103   5.0e-5              0.022         0000000
*         ebt
5820200     0    16855926.  1655951. 2418339. 1.
*         from      to        area        Kf    Kr   efvcahs
```

```
5821101   535010004 582010001 0.0003801  0.5   1.0   0001002
*         velf       velg     veli
5821201   -5.61836-10 -5.55804-15  0. * -2.45364-16
*         hyd dia   beta      y-int     slope
5821110   0.022     0.00      1.00      1.00
*
* pressurizer PORV
*======================================================================$
5850000                pzrporv       valve
*----------------------------------------------------------------------
*
*hydro    from       to          area      kf    kr   efvcahs
5850101   582010000  588000000   0.0003801 0.0   0.0  0000100
*
*         hyd dia   beta      y-int     slope
5850110   0.022     0.00      1.00      1.00
*
*         ic     velf       velg     veli
5850201   0      0.         0.       0. * 0.
*
5850300   mtrvlv
*
*         open  close rate  init
5850301   1583  1585   2.0   0.
*
*======================================================================*
5880000   pzrporva tmdpvol
*----------------------------------------------------------------------*
*         area                length          volume
5880101   0.0003801            1.0             0.0
*         azim angle          incl angle      delta z
5880102   0.00                 0.0              0.0
*         roughness           hyd dia       tlpvbfe
5880103   0.00000             0.022         0000010
*         ebt       trip          search var
5880200   004       0
*         indep var
5880201   0.00     1.0e5    300.0   1.0
*
*#######################################################################
*                        EMERGENCY CORE                                $
*                        COOLING SYSTEMS                               $
*#######################################################################
**************************** VOLUME 600 ******************************
* accumulator 4
*======================================================================
6000000             accum4          accum
*----------------------------------------------------------------------*
*
*hydro           area               length              volume
6000101         0.02986               0.0              0.2009
*
*hydro         horz angle          vert angle            delta z
6000102           0.                  90.                 6.728
*
*hydro          roughness           hyd diam          tlpvbfe
6000103           4.57e-5              0.                  00
*
*hydro          pressure           temp
6000200         5.90e+6            303.0
*
*hydro           to        area      kf          kr          vcahs
6001101       601000000   4.909-4   0.49        0.97        01000
*
*           vol    lvl    length   drop   thck  flg  dens   hcap  trip
6002200   0.16691  0.0     0.0      0.0   0.025   0   0.    0.    0
*
**************************** VOLUME 601 ******************************
```

```
6010000         acc4sl                pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
6010001    2
*
*hydro   vol area    vol
6010101   4.909-4      1
6010102   6.157-4      2
*
*hydro   jun area    jun
6010201   4.909-4      1
*
*hydro  length       vol
6010301  1.200         1
6010302  6.010         2
*
*hydro   volume      vol
6010401   0.0          2
*
*hydro   vert angle  vol
6010601 -21.0          1
6010602 -30.2          2
*
*hydro   delta z     vol
6010701  -0.460        1
6010702  -3.500        2
*
*hydro   roughness  hyd diam  vol
6010801   4.57e-5     0.025     1
6010802   4.57e-5     0.032     2
*
*hydro    Kfwd       Krev     jun
6010901   1.777      1.837      1
*
*hydro   fe         vol
6011001  00           2
*
*hydro  fvcahs       jun
6011101 001000         1
*
*hydro  ebt                                                 vol
6011201  0          16874942.   112036.6  2412737. 0.     0.    1
6011202  0          16894430.   118031.7  2412235. 0.     0.    2
*                                             jun
6011301   -5.38914-10 -5.51175-10 0.           1 * -2.65487-10
*
*         diamj       beta    c       m        jun
6011401   0.025       0.0     1.0     1.0      1
*
***************************** JUNCTION 603 ****************************
* accumulator isolation valve
*=====================================================================$
6030000                acc4out        valve
*---------------------------------------------------------------------
*
*hydro    from          to            area     kf    kr     vcahs
6030101   601020002     015040003    6.157-4  0.0    0.0    01101
*
6030201   0        -3.82458-9  -3.851724-9 0. * -1.778327-9
*
6030300   trpvlv
6030301    600
*
***************************** VOLUME 605 ******************************
* accumulator 2
*======================================================================
6050000             accum2           accum
```

```
*-----------------------------------------------------------------------*
*
*hydro            area              length              volume
6050101          0.02986               0.0               0.2009
*
*hydro         horz angle          vert angle           delta z
6050102            0.                 90.                6.728
*
*hydro          roughness           hyd diam          tlpvbfe
6050103           4.57e-5             0.                 00
*
*hydro          pressure           temp
6050200         6.03e+6            308.0
*
*hydro           to        area      kf          kr          vcahs
6051101       606000000   4.909-4    0.49        0.97        01000
*
*           vol    lvl    length   drop   thck  flg  dens   hcap  trip
6052200   0.16691  0.0     0.0      0.0   0.025   0   0.     0.    0
*
***************************** VOLUME 606 ******************************
6060000         acc2sl                pipe
*-------------------------------------------------------------------------------*
*
*hydro   no. volumes
6060001    2
*
*hydro   vol area    vol
6060101   4.909-4      1
6060102   6.157-4      2
*
*hydro   jun area    jun
6060201   4.909-4      1
*
*hydro  length       vol
6060301  1.200         1
6060302  5.864         2
*
*hydro   volume      vol
6060401   0.0          2
*
*hydro   vert angle  vol
6060601 -21.0          1
6060602 -30.8          2
*
*hydro   delta z     vol
6060701  -0.460        1
6060702  -3.500        2
*
*hydro   roughness  hyd diam  vol
6060801   4.57e-5     0.025     1
6060802   4.57e-5     0.032     2
*
*hydro    Kfwd       Krev     jun
6060901   1.785      1.856      1
*
*hydro   fe         vol
6061001  00           2
*
*hydro  fvcahs       jun
6061101 001000         1
*
*hydro  ebt                                                 vol
6061201  0          16875490.   113683.2  2412723. 0.     0.    1
6061202  0          16894702.   270678.   2412228. 0.     0.    2
*                                             jun
6061301   -5.41105-10 -5.57952-10  0.         1 * -2.62329-10
*
```

```
*         diamj       beta    c       m        jun
6061401   0.025       0.0     1.0     1.0      1
*
**************************** JUNCTION 608 ****************************
* accumulator isolation valve
*====================================================================$
6080000                 acc2out        valve
*---------------------------------------------------------------------
*
*hydro    from          to            area     kf    kr     vcahs
6080101   606020002     015040003    6.157-4  0.0    0.0    01101
*
6080201   0        -3.42962-9  -3.45694-9  0. * -1.59468-9
*
6080300   trpvlv
6080301    605
*
*=============================================================================*
* HPIS fluid state
*=============================================================================*
6400000   hpistdv   tmdpvol
*-----------------------------------------------------------------------------*
*         area                length          volume
6400101   1.e5                 1.0              0.0
*         azim angle          incl angle      delta z
6400102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
6400103   0.00000             0.0000          00010
*         ebt       trip          search var
6400200   003       0
*         indep var
6400201      0.    10.0e6     297.1
6400202    300.    10.0e6     297.1
6400203    350.    10.0e6     297.15
6400204    500.    10.0e6     297.15
6400205    550.    10.0e6     297.1
6400206    650.    10.0e6     297.2
6400207    770.    10.0e6     297.2
6400208    950.    10.0e6     299.05
6400209   1040.    10.0e6     299.6
*
*====================================================================
* HPIS flow boundary condition
*====================================================================
6410000   hpistdj   tmdpjun
*         From      To        Area
6410101   640010000 401030003 0.0001131
*        vel/Kg     trip      var req.  # var req
6410200   1         641
*         Time    kg/s      kg/s      m/s
6410201   -1.     0.0       0.        0.
6410202    0.0    0.0       0.        0.
6410203    2.26   0.0       0.        0.
6410204    2.35   0.0800    0.        0.
6410205   21.79   0.0933    0.        0.
6410206   53.42   0.0967    0.        0.
6410207   55.28   0.2000    0.        0.
6410208   59.00   0.2000    0.        0.
6410209   62.72   0.3467    0.        0.
6410210   64.58   0.3467    0.        0.
6410211   65.51   0.3900    0.        0.
6410212   85.98   0.4000    0.        0.
6410213   95.28   0.4133    0.        0.
6410214  179.0    0.4180    0.        0.
6410215  425.51   0.4200    0.        0.
6410216  427.37   0.5633    0.        0.
6410217 1050.0    0.5633    0.        0.
*
```

```
**************************** VOLUME 660 ******************************
* accumulator 3
*=====================================================================
6600000             accum3           accum
*---------------------------------------------------------------------*
*
*hydro           area              length              volume
6600101         0.02986              0.0               0.2009
*
*hydro        horz angle          vert angle            delta z
6600102           0.                 90.                 6.728
*
*hydro         roughness           hyd diam          tlpvbfe
6600103           4.57e-5             0.                  00
*
*hydro         pressure           temp
6600200         5.90e+6           309.0
*
*hydro           to        area      kf          kr          vcahs
6601101       661000000   4.909-4    0.49        0.97        01000
*
*           vol    lvl    length   drop   thck  flg  dens   hcap  trip
6602200   0.16751  0.0     0.0      0.0   0.025   0   0.     0.    0
*
**************************** VOLUME 661 ******************************
6610000         acc3sl               pipe
*-----------------------------------------------------------------------------*
*
*hydro   no. volumes
6610001    2
*
*hydro   vol area    vol
6610101   4.909-4      1
6610102   6.157-4      2
*
*hydro   jun area    jun
6610201   4.909-4      1
*
*hydro  length       vol
6610301  1.260         1
6610302  3.610         2
*
*hydro   volume      vol
6610401   0.0          2
*
*hydro   vert angle  vol
6610601 -20.1          1
6610602 -25.2          2
*
*hydro   delta z     vol
6610701  -0.460        1
6610702  -1.700        2
*
*hydro   roughness  hyd diam  vol
6610801   4.57e-5     0.025     1
6610802   4.57e-5     0.032     2
*
*hydro    Kfwd       Krev     jun
6610901   1.785      1.846      1
*
*hydro   fe         vol
6611001  00           2
*
*hydro  fvcahs       jun
6611101 001000         1
*
*hydro  ebt                                                   vol
6611201  0          16874160.   112034.1  2412757. 0.     0.    1
```

```
6611202  0          16884788.   119472.3  2412484. 0.     0.    2
*                                              jun
6611301   -5.65851-10 -5.75362-10  0.         1 * -2.78726-10
*
*         diamj       beta    c       m        jun
6611401   0.025       0.0     1.0     1.0      1
*
***************************** JUNCTION 663 ****************************
* accumulator isolation valve
*=====================================================================$
6630000                acc3out        valve
*----------------------------------------------------------------------
*
*hydro    from          to            area     kf    kr     vcahs
6630101   661020002     062060003    6.157-4  0.0    0.0    01101
*
6630201   0        -2.73436-9 -2.75927-9 0. * -1.16309-9
*
6630300   trpvlv
6630301    660
*
***************************** VOLUME 665 ******************************
* accumulator 1
*======================================================================
6650000             accum1           accum
*----------------------------------------------------------------------*
*
*hydro           area               length              volume
6650101          0.02986              0.0               0.2009
*
*hydro         horz angle          vert angle            delta z
6650102            0.                 90.                 6.728
*
*hydro          roughness           hyd diam          tlpvbfe
6650103           4.57e-5              0.                   00
*
*hydro          pressure           temp
6650200         5.88e+6            306.0
*
*hydro           to         area      kf          kr          vcahs
6651101       666000000   4.909-4    0.49        0.97        01000
*
*            vol    lvl    length   drop   thck  flg  dens   hcap  trip
6652200   0.16661  0.0     0.0      0.0   0.025   0   0.     0.    0
*
***************************** VOLUME 666 ******************************
6660000         acc1sl                pipe
*------------------------------------------------------------------------------*
*
*hydro   no. volumes
6660001    2
*
*hydro   vol area    vol
6660101   4.909-4      1
6660102   6.157-4      2
*
*hydro   jun area    jun
6660201   4.909-4      1
*
*hydro  length       vol
6660301  1.260         1
6660302  3.610         2
*
*hydro   volume      vol
6660401   0.0          2
*
*hydro   vert angle  vol
6660601 -20.1          1
6660602 -25.2          2
*
*hydro   delta z     vol
6660701  -0.460        1
6660702  -1.700        2
*
*hydro   roughness  hyd diam  vol
6660801   4.57e-5     0.025     1
6660802   4.57e-5     0.032     2
*
*hydro    Kfwd       Krev     jun
6660901   1.785      1.846      1
*
*hydro   fe         vol
6661001  00           2
*
*hydro  fvcahs       jun
6661101 001000         1
*
*hydro  ebt                                                     vol
6661201  0          16874160.   112034.1  2412757. 0.     0.    1
6661202  0          16884788.   119472.3  2412484. 0.     0.    2
*                                              jun
6661301   -5.65851-10 -5.75362-10  0.         1 * -2.78726-10
*
*         diamj       beta    c       m        jun
6661401   0.025       0.0     1.0     1.0      1
*
***************************** JUNCTION 668 ****************************
* accumulator isolation valve
*=====================================================================$
6680000                acc1out        valve
*----------------------------------------------------------------------
*
*hydro    from          to            area     kf    kr     vcahs
6680101   666020002     062060003    6.157-4  0.0    0.0    01101
*
6680201   0        -2.73436-9 -2.75927-9 0. * -1.16309-9
*
6680300   trpvlv
6680301    665
*
***************************** VOLUME 700 ******************************
* Common steam header
*=======================================================================
7000000        stmhdr         pipe
*-----------------------------------------------------------------------
7000001   10
*
*         flow areas
7000101   0.001452 10
*
*         Jct Flow Areas
7000201   0.001452  9
*
*         lengths
7000301   1.13      1
7000302   1.011     3
7000303   1.08      4
7000304   2.406     6
7000305   3.85      7
7000306   4.356     8
7000307   6.6       9
7000308   7.324    10
*
*         volumes
7000401   0.0      10
*
```

```
*         horiz     #
7000501  180.0      6
7000502    0.0      7
7000503  270.0      8
7000504    0.0      9
7000505  180.0     10
*
*         azimuth   #
7000601   0.0       6
7000602 -90.0       7
7000603   0.0       8
7000604 -90.0       9
7000605   0.0      10
*
*         deltaz
7000701   0.0       6
7000702  -3.85      7
7000703   0.0       8
7000704  -6.6       9
7000705   0.0      10
*
*         rough     dhyd
7000801   5.0e-5     0.043      10
*
*         laminar wall friction
*402501   1.0    0.0    1.0  0.0    1.0  0.0     1
*
*         kfor      krev      #
7000901   0.087     0.087     1
7000902   0.174     0.174     2
7000903   0.087     0.087     3
7000904   0.0       0.0       5
7000905   0.087     0.087     6
7000906   0.126     0.126     7
7000907   0.213     0.213     8
7000908   0.174     0.174     9
*
*         pvbfe     #
7001001   00000     10
*
*
*         fvcahs    #
7001101   001000    9
*
*        volume ic
7001201  0    7157091.  1265778. 2580201. .999961 0. 1
7001202  0    7155903.  1265721. 2580195. .999957 0. 2
7001203  0    7155367.  1265692. 2580205. .999956 0. 3
7001204  0    7154420.  1265648. 2580217. .999954 0. 4
7001205  0    7150414.  1265448. 2580236. .999949 0. 5
7001206  0    7147160.  1265288. 2580271. .99995  0. 6
7001207  0    7143383.  1265093. 2580346. .999958 0. 7
7001208  0    7138114.  1264838. 2580392. .999957 0. 8
7001209  0    7131250.  1264487. 2580496. .99994  0. 9
7001210  0    7122557.  1264062. 2580571. .999931 0. 10
*
*         vel/flow
7001300   0
*
*        jct ic
7001301   3.60553        6.16732  0.   1 * .335565
7001302   4.02871        6.16703  0.   2 * .3355116
7001303   5.10129        6.16656  0.   3 * .335528
7001304   12.22847       12.36246 0.   4 * .672688
7001305   12.28481       12.36898 0.   5 * .672699
7001306   12.29518       12.37533 0.   6 * .672681
7001307   11.80277       12.38323 0.   7 * .672526
7001308   11.0682        12.39192 0.   8 * .672447
7001309   12.33807       12.39936 0.   9 * .672361
*
*=====================================================================*
*      steam header outlet junction
*====================================================================
7020000   stmhdrj  sngljun
*hydro    from          to           area      f loss    r loss   fvcahs
7020101   700010000  705000000      0.001452    0.0       0.0    001000
*          Dhyd      beta      c        m
7020110    0.043     0.0       1.0     1.0
*
7020201    0         12.27085 12.40995 0. * .672132
*
*=====================================================================*
7050000   stmhdrp  tmdpvol
*---------------------------------------------------------------------*
*         area               length          volume
7050101   0.001452            1.0              0.0
*         azim angle         incl angle      delta z
7050102   0.00                0.0              0.0
*         roughness          hyd dia       tlpvbfe
7050103   0.00000            0.043         0000010
*         ebt       trip      search var
7050200   002       0                                             * trancalc
*7050200   002       0         cntrlvar 9705                       * sscalc
*         indep var
7050201    0.0     7.117636e6  1.0                                * trancalc
*7050201   1.e5     1.e5     1.0                                   * sscalc
*7050202   1.e8     1.e8     1.0                                   * sscalc
*
*=============================================================================*
8000000   brkpipe    branch
*-----------------------------------------------------------------------------
*         no. juns  vel/flow
8000001   1         0
*         area               length          volume
8000101   1.59-3             0.480           0.
*         azim angle         incl angle      delta z
8000102   0.0                   .0            0.0
*         roughness          hyd dia         pvbfe
8000103   4.57e-5            0.045           00000
*         ebt
8000200     0    16892936.  1430077. 2412274. 0.
*         from      to        area      Kf    Kr    fvcahs
8001101   066010004 800010001 1.59-3    0.038 0.038 001002
*         velf       velg     veli
8001201   1.033496-9   1.033496-9   0. * 1.135255-9
*         hyd dia   beta      y-int     slope
8001110   0.045     0.00      1.00      1.00
*
*=============================================================================*
8010000   break    valve
*-----------------------------------------------------------------------------
*         from      to        area      Kf    Kr    fvcahs
8010101   800010002 802000000 2.011-4   1.465 1.465 000100
*         subc      2phase    superht
*8010102   0.57      0.6       1.0
8010102   0.8       1.0       1.0
*         hyd dia   beta      y-int     slope
8010110   0.016     0.00      1.00      1.00
*         vf  velf       velg     veli
8010201   0   0.         0.       0. * 0.
*         type
8010300   mtrvlv
*         open  close rate     init
 8010301    801    2   0.66667  0.    * full open in 1.5 s
*
*=============================================================================*
```

```
8020000   atmosph   tmdpvol
*----------------------------------------------------------------------------*
*         area                length          volume
8020101   1.e5                 1.0              0.0
*         azim angle          incl angle      delta z
8020102   0.00                 0.0              0.0
*         roughness           hyd dia         pvbfe
8020103   0.00000             0.0000          00010
*         ebt       trip          search var
8020200   003       0
*         indep var
8020201   0.00     1.013+5     375.0
*
******************************************************************************
*                          Heat Structures
******************************************************************************
************************* STRUCTURE 0151 *************************************
* downcomer external wall
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10151000   1       11    2     1    0.05991   0
*
*         loc       flag
10151100  0         2
*
*         dx        int
10151101  0.00139   2
10151102  0.00278   4
10151103  0.00417   6
10151104  0.00555   8
10151105  0.04116   10
*
*        compos.    int
10151201  1         8
10151202  3         10
*
*         source    int
10151301  0.0       10
*
*        temperature flag
10151400  0
*
*         temperature pt
10151401  563.15      11
*
*         vol       inc       type      code      factor      hs
10151501  015010000 0         1         1         0.525       1
*
*         vol       inc       type      code      factor      hs
10151601 -900       0         4910        1       0.525       1
*
* source  type      mult      D-lt      D-rt      hs
10151701  0         0.0       0.0       0.0       1
*
10151800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10151801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   8.08 1.1  1.0  1
*============================================================================$
************************* STRUCTURE 0152 *************************************
* downcomer external wall
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10152000   1       11    2     1    0.07901   0
*
*         loc       flag
10152100  0         2
*
*         dx        int
```

```
10152101  0.00197   2
10152102  0.00394   4
10152103  0.00591   6
10152104  0.00788   8
10152105  0.02580   10
*
*        compos.    int
10152201  1         8
10152202  3         10
*
*         source    int
10152301  0.0       10
*
*        temperature flag
10152400  0
*
*         temperature pt
10152401  563.15      11
*
*         vol       inc       type      code      factor      hs
10152501  015020000 0         1         1         0.390       1
*
*         vol       inc       type      code      factor      hs
10152601 -900       0         4910        1       0.390       1
*
* source  type      mult      D-lt      D-rt      hs
10152701  0         0.0       0.0       0.0       1
*
10152800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10152801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   8.08 1.1  1.0  1
************************* STRUCTURE 0153 *************************************
* downcomer external wall
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10153000   2       11    2     1    0.09027   0
*
*         loc       flag
10153100  0         2
*
*         dx        int
10153101  0.00251   2
10153102  0.00501   4
10153103  0.00752   6
10153104  0.01003   8
10153105  0.01480   10
*
*        compos.    int
10153201  1         8
10153202  3         10
*
*         source    int
10153301  0.0       10
*
*        temperature flag
10153400  0
*
*         temperature pt
10153401  563.15      11
*
*         vol       inc       type      code      factor      hs
10153501  015030000 10000     1         1         0.200       2
*
*         vol       inc       type      code      factor      hs
10153601 -900       0         4910        1       0.200       2
*
* source  type      mult      D-lt      D-rt      hs
10153701  0         0.0       0.0       0.0       2
```

```
*
10153800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10153801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   8.08 1.1  1.0  2
************************* STRUCTURE 0154 *************************************
* downcomer external wall
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10154000   1      11    2     1    0.06938   0
*
*         loc       flag
10154100  0         2
*
*         dx        int
10154101  0.00152   2
10154102  0.00304   4
10154103  0.00457   6
10154104  0.00609   8
10154105  0.03509   10
*
*        compos.    int
10154201  1         8
10154202  3         10
*
*         source    int
10154301  0.0       10
*
*        temperature flag
10154400  0
*
*         temperature pt
10154401  563.15      11
*
*         vol       inc       type      code      factor      hs
10154501  015050000 0         1         1         0.560       1
*
*         vol       inc       type      code      factor      hs
10154601 -900       0         4910        1       0.560       1
*
* source  type      mult      D-lt      D-rt      hs
10154701  0         0.0       0.0       0.0       1
*
10154800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10154801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   8.08 1.1  1.0  1
************************* STRUCTURE 0155 *************************************
* downcomer external wall
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10155000   9      11    2     1    0.05950   0
*
*         loc       flag
10155100  0         2
*
*         dx        int
10155101  0.00100   2
10155102  0.00200   4
10155103  0.00300   6
10155104  0.00400   8
10155105  0.04525   10
*
*        compos.    int
10155201  1         8
10155202  3         10
*
*         source    int
10155301  0.0       10
*
*        temperature flag
10155400  0
*
*         temperature pt
10155401  563.15      11
*
*         vol       inc       type      code      factor      hs
10155501  015060000 0         1         1         0.475       1
10155502  015070000 0         1         1         0.275       2
10155503  015080000 0         1         1         0.470       3
10155504  015090000 10000     1         1         0.510       9
*
*         vol       inc       type      code      factor      hs
10155601 -900       0         4910        1       0.475       1
10155602 -900       0         4910        1       0.275       2
10155603 -900       0         4910        1       0.470       3
10155604 -900       0         4910        1       0.510       9
*
* source  type      mult      D-lt      D-rt      hs
10155701  0         0.0       0.0       0.0       9
*
10155800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10155801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   8.08 1.1  1.0  9
************************* STRUCTURE 0156 *************************************
* downcomer external wall
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10156000   1      11    2     1    0.06202   0
*
*         loc       flag
10156100  0         2
*
*         dx        int
10156101  0.00132   2
10156102  0.00264   4
10156103  0.00396   6
10156104  0.00527   8
10156105  0.04080   10
*
*        compos.    int
10156201  1         8
10156202  3         10
*
*         source    int
10156301  0.0       10
*
*        temperature flag
10156400  0
*
*         temperature pt
10156401  563.15      11
*
*         vol       inc       type      code      factor      hs
10156501  015050000 0         1         1         0.345       1
*
*         vol       inc       type      code      factor      hs
10156601 -900       0         4910        1       0.345       1
*
* source  type      mult      D-lt      D-rt      hs
10156701  0         0.0       0.0       0.0       1
*
10156800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10156801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   8.08 1.1  1.0  1
************************* STRUCTURE 0181 *************************************
* downcomer external wall
*============================================================================$
```

```
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10181000   1       11    2     1    0.08650   0
*
*         loc       flag
10181100  0         2
*
*         dx        int
10181101  0.00107   2
10181102  0.00214   4
10181103  0.00321   6
10181104  0.00428   8
10181105  0.03105   10
*
*        compos.    int
10181201  1         8
10181202  3         10
*
*         source    int
10181301  0.0       10
*
*        temperature flag
10181400  0
*
*         temperature pt
10181401  563.15      11
*
*         vol       inc       type      code      factor      hs
10181501  018010000 0         1         1         0.826       1
*
*         vol       inc       type      code      factor      hs
10181601 -900       0         4910        1       0.826       1
*
* source  type      mult      D-lt      D-rt      hs
10181701  0         0.0       0.0       0.0       1
*
10181800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10181801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.57 1.1  1.0  1
************************** STRUCTURE 0201 ***************************************
* downcomer external wall
*==========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10201000   1       11    2     1    0.07918   0
*
*         loc       flag
10201100  0         2
*
*         dx        int
10201101  0.00189   2
10201102  0.00379   4
10201103  0.00568   6
10201104  0.00758   8
10201105  0.02648   10
*
*        compos.    int
10201201  1         8
10201202  3         10
*
*         source    int
10201301  0.0       10
*
*        temperature flag
10201400  0
*
*         temperature pt
10201401  563.15      11
*
*         vol       inc       type      code      factor      hs
10201501  020010000 0         1         1         0.450       1
*
*         vol       inc       type      code      factor      hs
10201601 -900       0         4910        1       0.450       1
*
* source  type      mult      D-lt      D-rt      hs
10201701  0         0.0       0.0       0.0       1
*
10201800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10201801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.57 1.1  1.0  1
************************** STRUCTURE 0241 ***************************************
* lower plenum  external wall
*==========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10221000   1       11    2     1    0.09000   0
*
*         loc       flag
10221100  0         2
*
*         dx        int
10221101  0.00178   2
10221102  0.00356   4
10221103  0.00534   6
10221104  0.00712   8
10221105  0.02219   10
*
*        compos.    int
10221201  1         8
10221202  3         10
*
*         source    int
10221301  0.0       10
*
*        temperature flag
10221400  0
*
*         temperature pt
10221401  563.15      11
*
*         vol       inc       type      code      factor      hs
10221501  022010000 0         1         1         0.284       1
*
*         vol       inc       type      code      factor      hs
10221601 -900       0         4910        1       0.284       1   * trancalc
*10221601  0         0         0          1       0.284       1   * sscalc
*
* source  type      mult      D-lt      D-rt      hs
10221701  0         0.0       0.0       0.0       1
*
10221800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10221801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.57 1.1  1.0  1
************************** STRUCTURE 0101 ***************************************
* downcomer shield
*==========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10101000   3       11    2     1    0.07060   0
*
*         loc       flag
10101100  0         2
*
*         dx        int
10101101  0.00107   2
10101102  0.00214   4
10101103  0.00429   6
10101104  0.00214   8
10101105  0.00107   10
```

```
*
*        compos.    int
10101201  1         10
*
*         source    int
10101301  0.0       10
*
*        temperature flag
10101400  0
*
*         temperature pt
10101401  563.15      11
*
*         vol       inc       type      code      factor      hs
10101501  015020000 0         1         1         0.0602      1
10101502  015030000 0         1         1         0.1416      2
10101503  015040000 0         1         1         0.1239      3
*
*         vol       inc       type      code      factor      hs
10101601  015020000 0         1         1         0.0602      1
10101602  010010000 0         1         1         0.1416      2
10101603  012010000 0         1         1         0.1239      3
*
* source  type      mult      D-lt      D-rt      hs
10101701  0         0.0       0.0       0.0       3
*
10101800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10101801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.460 1.1  1.0  3
*
10101900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10101901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.460 1.1  1.0  3
************************** STRUCTURE 0202 **************************************
* perforated cylinder
*===============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10202000   3       11    2     1    0.04401   0
*
*         loc       flag
10202100  0         2
*
*         dx        int
10202101  0.00081   2
10202102  0.00162   4
10202103  0.00325   6
10202104  0.00162   8
10202105  0.00081   10
*
*        compos.    int
10202201  1         10
*
*         source    int
10202301  0.0       10
*
*        temperature flag
10202400  0
*
*         temperature pt
10202401  563.15      11
*
*         vol       inc       type      code      factor      hs
10202501  015160000 0         1         1         0.5027      1
10202502  015170000 0         1         1         0.9026      2
10202503  024010000 0         1         1         0.1158      3
*
*         vol       inc       type      code      factor      hs
10202601  020010000 0         1         1         0.5027      1
10202602  018010000 0         1         1         0.9026      2
10202603  024010000 0         1         1         0.1158      3
*
* source  type      mult      D-lt      D-rt      hs
10202701  0         0.0       0.0       0.0       3
*
10202800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10202801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   7.90 1.1  1.0  3
*
10202900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10202901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.39 1.1  1.0  3
************************** STRUCTURE 0241 **************************************
* connection pipe wall
*===============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10241000   1       11    2     1    0.05000   0
*
*         loc       flag
10241100  0         2
*
*         dx        int
10241101  0.00064   2
10241102  0.00127   4
10241103  0.00191   6
10241104  0.00254   8
10241105  0.04000   10
*
*        compos.    int
10241201  1         8
10241202  3         10
*
*         source    int
10241301  0.0       10
*
*        temperature flag
10241400  0
*
*         temperature pt
10241401  563.15      11
*
*         vol       inc       type      code      factor      hs
10241501  024010000 0         1         1         0.586       1
*
*         vol       inc       type      code      factor      hs
10241601 -900       0         4910        1       0.586       1
*
* source  type      mult      D-lt      D-rt      hs
10241701  0         0.0       0.0       0.0       1
*
10241800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10241801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.100 1.1  1.0  1
*
************************** STRUCTURE 0261 **************************************
* downcomer to upper plenum bypass
*===============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10261000   3       11    2     1    0.00900   0
*
*         loc       flag
10261100  0         2
*
*         dx        int
10261101  0.00018   2
10261102  0.00035   4
10261103  0.00053   6
```

```
10261104  0.00070   8
10261105  0.00875   10
*
*        compos.    int
10261201  1         8
10261202  3         10
*
*         source    int
10261301  0.0       10
*
*        temperature flag
10261400  0
*
*         temperature pt
10261401  563.15      11
*
*         vol       inc       type      code      factor      hs
10261501  026010000 0         1         1         0.9025      1
10261502  026020000 0         1         1         1.534       2
10261503  028010000 0         1         1         0.8297      3
*
*         vol       inc       type      code      factor      hs
10261601 -900       0         4910        1       0.9025      1
10261602 -900       0         4910        1       1.534       2
10261603 -900       0         4910        1       0.8297      3
*
* source  type      mult      D-lt      D-rt      hs
10261701  0         0.0       0.0       0.0       3
*
10261800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10261801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.12 1.1  1.0  2
10261802 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.018 1.1  1.0  3
*************************** STRUCTURE 0301 ***************************
* lower heater rod simulator (unheated part)
*====================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10301000    2       8    2     1      0.0
*
*        loc      flag
10301100  0         1
*
*        #         r
10301101  3         0.00200
10301102  2         0.00415
10301103  2         0.00455
*
*        compos.    #
10301201  2         3 * copper conductor
10301202 -5         5 * mgo insulator
10301203 -1         7 * cladding
*
*         source    #
10301301  0.0       7
*
*        temperature flag
10301400  0
*
*         temperature #
10301401  560.00      8
*
*         vol       inc       type      code      factor      #
10301501  0         0         0         0         0.0         2
*
*         vol       inc       type      code      factor      #
10301601  030010000        0        110      1     51.74    1
10301602  030020000        0        110      1     72.41    2
*
*         type      mult      D-lt      D-rt      #   *source
10301701     0    0.0           0.0      0.0       2
*
10301900    0
*
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10301901  0.0     10.     10.     0.      0.      0.0  0.0  1.   2
*
*************************** STRUCTURE 0302 ***************************
* vessel lower flange
*====================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10302000    1       7    2     1      0.13
*
*        loc      flag
10302100  0         1
*
*         #         r
10302101  6         0.3
*
*        compos.    #
10302201  1         6 * stainless steel
*
*         source    #
10302301  0.0       6
*
*        temperature flag
10302400  0
*
*         temperature #
10302401  560.00      7
*
*         vol       inc       type      code      factor      #
10302501  030010000  0        1         1         0.308       1
*
*         vol       inc       type      code      factor      #
10302601   -900      0         4910    1         0.308       1
*
*         type      mult      D-lt      D-rt      #   *source
*
10302701     0    0.0           0.0      0.0       1
*
10302800    0
*
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10302801  0.0     10.     10.     0.      0.      0.0  0.0  1.   1
*
*************************** STRUCTURE 0303 ***************************
* web region
*====================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10303000    1       7    2     1      0.096
*
*        loc      flag
10303100  0         1
*
*         #         r
10303101  6         0.16
*
*        compos.    #
10303201  1         6 * stainless steel
*
*         source    #
10303301  0.0       6
*
```

```
*        temperature flag
10303400  0
*
*         temperature #
10303401  560.00      7
*
*         vol       inc       type      code      factor      #
10303501  030020000  0         1         1         0.080       1
*
*         vol       inc       type      code      factor      #
10303601  -900       0         4910     1         0.080       1
*
*         type      mult      D-lt      D-rt      #   *source
*
10303701     0    0.0           0.0      0.0       1
*
10303800    0
*
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10303801  0.0     10.     10.     0.      0.      0.0  0.0  1.   1
*
*************************** STRUCTURE 0304 ***************************
* vessel
*===================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10304000    16      7    2     1      0.0882
*
*        loc      flag
10304100  0        1
*
*         #         r
10304101  6         0.14
*
*        compos.    #
10304201  1         6 * stainless steel
*
*         source    #
10304301  0.0       6
*
*        temperature flag
10304400  0
*
*         temperature #
10304401  560.00      7
*
*         vol       inc       type      code      factor      #
10304501  030020000  0         1         1         0.351       1
10304502  040010000  10000     1         1         0.255      14
10304503  040140000  0         1         1         0.215      15
10304504  040150000  0         1         1         0.275      16
*
*         vol       inc       type      code      factor      #
10304601  -900       0         4910     1         0.351       1
10304602  -900       0         4910     1         0.255      14
10304603  -900       0         4910     1         0.215      15
10304604  -900       0         4910     1         0.275      16
*
*         type      mult      D-lt      D-rt      #   *source
*
10304701     0    0.0           0.0      0.0       16
*
10304800    0
*
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10304801  0.0     10.     10.     0.      0.      0.0  0.0  1.   16
*
*************************** STRUCTURE 0401 ***************************
```

```
* fuel rod simulator
*===================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10401000   14       8    2     1      0.0
*
*        loc      flag
10401100  0        1
*
*         #         r
10401101  3         0.00125
10401102  2         0.00415
10401103  2         0.00455
*
*        compos.    #
10401201  4         3 * nichrome heater
10401202 -5         5 * mgo insulator
10401203 -1         7 * cladding
*
*         source    #
10401301  1.0       3
10401302  0.0       7
*
*        temperature flag
10401400  0
*
*         temperature #
10401401  560.00      8
*
*         vol       inc       type      code      factor      #
10401501  0         0         0         0         0.0        14
*
*         vol       inc       type      code      factor      #
10401601  040010000    10000        110      1     42.84   13
10401602  040140000        0        110      1     36.12   14
*
*         type      mult      D-lt      D-rt      #   *source
10401701   100    0.072238      0.0      0.0      13
10401702   100    0.060907      0.0      0.0      14
*
10401900    0
*
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10401901  0.0112  0.1275  3.4025  0.1075  0.1075  0.1  0.1  1.0  1
10401902  0.0112  0.3825  3.1475  0.1275  0.1275  0.1  0.1  1.0  2
10401903  0.0112  0.6375  2.8925  0.1275  0.1275  0.1  0.1  1.0  3
10401904  0.0112  0.8925  2.6375  0.1275  0.1275  0.1  0.1  1.0  4
10401905  0.0112  1.1475  2.3825  0.1275  0.1275  0.1  0.1  1.0  5
10401906  0.0112  1.4025  2.1275  0.1275  0.1275  0.1  0.1  1.0  6
10401907  0.0112  1.6575  1.8725  0.1275  0.1275  0.1  0.1  1.0  7
10401908  0.0112  1.9125  1.6175  0.1275  0.1275  0.1  0.1  1.0  8
10401909  0.0112  2.1675  1.3625  0.1275  0.1275  0.1  0.1  1.0  9
10401910  0.0112  2.4225  1.1075  0.1275  0.1275  0.1  0.1  1.0  10
10401911  0.0112  2.6775  0.8525  0.1275  0.1275  0.1  0.1  1.0  11
10401912  0.0112  2.9325  0.5975  0.1275  0.1275  0.1  0.1  1.0  12
10401913  0.0112  3.1875  0.3425  0.1275  0.1275  0.1  0.1  1.0  13
10401914  0.0112  3.4225  0.1075  0.1075  0.1075  0.1  0.1  1.0  14
*
*************************** STRUCTURE 0402 ***************************
* upper heater rod simulator (unheated part)
*===================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10402000    1       8    2     1      0.0
*
*        loc      flag
10402100  0        1
*
```

```
*         #         r
10402101  5         0.00415
10402102  2         0.00455
*
*        compos.    #
10402201  2         5 * copper conductor
10402202  1         7 * cladding
*
*         source    #
10402301  0.0       7
*
*        temperature flag
10402400  0
*
*         temperature #
10402401  560.00      8
*
*         vol       inc       type      code      factor      #
10402501  0         0         0         0         0.0         1
*
*         vol       inc       type      code      factor      #
10402601  040150000        0        110      1     46.20    1
*
*         type      mult      D-lt      D-rt      #   *source
10402701    0    0.0           0.0      0.0       1
*
10402900    0
*
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10402901  0.0     10.     10.     0.      0.      0.0  0.0  1.   1
*
**************************** STRUCTURE 0451 ****************************
* core tie plate, stainless steel part
*=====================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10451000    1       3    1     1      0.0
*
*        loc      flag
10451100  0         1
*
*         #         r
10451101  2         0.015
*
*        compos.    #
10451201  1         2 * stainless steel
*
*         source    #
10451301  0.0       2
*
*        temperature flag
10451400  0
*
*         temperature #
10451401  560.00      3
*
*         vol       inc       type      code      factor      #
10451501  040150000  0        1         1         0.038       1
*
*         vol       inc       type      code      factor      #
10451601  -900       0         4910     1         0.038       1
*
*         type      mult      D-lt      D-rt      #   *source
*
10451701    0    0.0           0.0      0.0       1
*
10451800    0
*
```

```
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10451801  0.0     10.     10.     0.      0.      0.0  0.0  1.   1
*
**************************** STRUCTURE 0452 ****************************
* core tie plate, copper part
*=====================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10452000    1       3    1     1      0.0
*
*        loc      flag
10452100  0         1
*
*         #         r
10452101  2         0.030
*
*        compos.    #
10452201  2         2 * copper
*
*         source    #
10452301  0.0       2
*
*        temperature flag
10452400  0
*
*         temperature #
10452401  560.00      3
*
*         vol       inc       type      code      factor      #
10452501  062010000  0        1         1         0.038       1
*
*         vol       inc       type      code      factor      #
10452601  -900       0         4910     1         0.038       1
*
*         type      mult      D-lt      D-rt      #   *source
*
10452701    0    0.0           0.0      0.0       1
*
10452800    0
*
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10452801  0.0     10.     10.     0.      0.      0.0  0.0  1.   1
*
************************* STRUCTURE 0501 *************************************
* bypass pipe for horizontal section
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10501000   1       7    2     1    0.02516   0
*
*
*         loc       flag
10501100  0         1
*
*         int       r.coord
10501101  4         0.02837
10501102  2         0.09000
*
*        compos.    int
10501201  1         4
10501202  3         6
*
*         source    int
10501301  0.0       6
*
*        temperature flag
10501400  0
*
*
```

```
*         temperature pt
10501401  563.15      7
*
*         vol       inc       type      code      factor      hs
10501501  050010000 0         1         1         1.0375      1
*
*         vol       inc       type      code      factor      hs
10501601 -900       0         4910        1       1.0375      1
*
* source  type      mult      D-lt      D-rt      hs
10501701  0         0.0       0.0       0.0       1
*
10501800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10501801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   8.08 1.1  1.0  1
*
*************************** STRUCTURE 0502 ***************************
* vessel
*====================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
*cccg
10502000     9      9    2     1      0.02084
*
*        loc      flag
10502100  0         1
*
*         #         r
10502101  6         0.032062
10502102  2         0.090000
*
*        compos.    #
10502201  1         6 * stainless steel
10502202  3         8 * insulation
*
*         source    #
10502301  1.0       6
10502302  0.0       8
*
*        temperature flag
10502400  0
*
*         temperature #
10502401  560.00      9
*
*         vol       inc       type      code      factor      #
10502501  050020000  0         1         1         0.585       1
10502502  050030000  0         1         1         0.51        2
10502503  050040000  10000     1         1         0.51        7
10502504  050090000  0         1         1         0.636       8
10502505  050100000  0         1         1         2.1475      9
*
*         vol       inc       type      code      factor      #
10502601  -900       0         4910     1         0.585       1
10502602  -900       0         4910     1         0.51        2
10502603  -900       0         4910     1         0.51        7
10502604  -900       0         4910     1         0.636       8
10502605  -900       0         4910     1         2.1475      9
*
*         type      mult      D-lt      D-rt      #   *source
*
10502701    0     0.0           0.0      0.0       1
10502702    50    0.14286       0.0      0.0       8
10502703    0     0.0           0.0      0.0       9
*
10502800    0
*
*         Dhe     Lhef    Lher    Lgsf    Lgsr    Kfwd Krev Fboil no
10502801  0.0     10.     10.     0.      0.      0.0  0.0  1.    9
```

```
*
************************** STRUCTURE 0621 **************************************
* upper plenum external wall
*===============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10621000   1      11    2     1    0.11000   0
*
*         loc       flag
10621100  0         2
*
*         dx        int
10621101  0.00476   2
10621102  0.00952   4
10621103  0.01428   6
10621104  0.01903   8
10621105  0.03500   10
*
*        compos.    int
10621201  1         8
10621202  3         10
*
*         source    int
10621301  0.0       10
*
*        temperature flag
10621400  0
*
*         temperature pt
10621401  563.15      11
*
*         vol       inc       type      code      factor      hs
10621501  062010000 0         1         1         0.475       1
*
*         vol       inc       type      code      factor      hs
10621601 -900       0         4910        1       0.475       1
*
* source  type      mult      D-lt      D-rt      hs
10621701  0         0.0       0.0       0.0       1
*
10621800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10621801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
*
************************** STRUCTURE 0622 **************************************
* upper plenum external wall
*===============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10622000   1      11    2     1    0.10280   0
*
*         loc       flag
10622100  0         2
*
*         dx        int
10622101  0.00532   2
10622102  0.01064   4
10622103  0.01596   6
10622104  0.02129   8
10622105  0.04373   10
*
*        compos.    int
10622201  1         8
10622202  3         10
*
*         source    int
10622301  0.0       10
*
*        temperature flag
10622400  0
```

```
*
*         temperature pt
10622401  563.15      11
*
*         vol       inc       type      code      factor      hs
10622501  062020000 0         1         1         0.775       1
*
*         vol       inc       type      code      factor      hs
10622601 -900       0         4910        1       0.775       1
*
* source  type      mult      D-lt      D-rt      hs
10622701  0         0.0       0.0       0.0       1
*
10622800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10622801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
*
************************* STRUCTURE 0623 *************************************
* upper plenum external wall
*=========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10623000   1       11    2     1    0.10104   0
*
*         loc       flag
10623100  0         2
*
*         dx        int
10623101  0.00415   2
10623102  0.00829   4
10623103  0.01244   6
10623104  0.01658   8
10623105  0.04373   10
*
*        compos.    int
10623201  1         8
10623202  3         10
*
*         source    int
10623301  0.0       10
*
*        temperature flag
10623400  0
*
*         temperature pt
10623401  563.15      11
*
*         vol       inc       type      code      factor      hs
10623501  062030000 0         1         1         0.575       1
*
*         vol       inc       type      code      factor      hs
10623601 -900       0         4910        1       0.575       1
*
* source  type      mult      D-lt      D-rt      hs
10623701  0         0.0       0.0       0.0       1
*
10623800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10623801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
*
************************* STRUCTURE 0624 *************************************
* upper plenum external wall
*=========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10624000   1       11    2     1    0.08989   0
*
*         loc       flag
10624100  0         2
*
*         dx        int
10624101  0.00474   2
10624102  0.00948   4
10624103  0.01423   6
10624104  0.01897   8
10624105  0.04333   10
*
*        compos.    int
10624201  1         8
10624202  3         10
*
*         source    int
10624301  0.0       10
*
*        temperature flag
10624400  0
*
*         temperature pt
10624401  563.15      11
*
*         vol       inc       type      code      factor      hs
10624501  062040000 0         1         1         0.525       1
*
*         vol       inc       type      code      factor      hs
10624601 -900       0         4910        1       0.525       1
*
* source  type      mult      D-lt      D-rt      hs
10624701  0         0.0       0.0       0.0       1
*
10624800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10624801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
*
************************* STRUCTURE 0625 *************************************
* upper plenum external wall
*=========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10625000   1       11    2     1    0.08922   0
*
*         loc       flag
10625100  0         2
*
*         dx        int
10625101  0.00170   2
10625102  0.00340   4
10625103  0.00509   6
10625104  0.00679   8
10625105  0.04342   10
*
*        compos.    int
10625201  1         8
10625202  3         10
*
*         source    int
10625301  0.0       10
*
*        temperature flag
10625400  0
*
*         temperature pt
10625401  563.15      11
*
*         vol       inc       type      code      factor      hs
10625501  062050000 0         1         1         0.475       1
*
*         vol       inc       type      code      factor      hs
10625601 -900       0         4910        1       0.475       1
*
```

```
* source  type      mult      D-lt      D-rt      hs
10625701  0         0.0       0.0       0.0       1
*
10625800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10625801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
*
************************* STRUCTURE 0661 **************************************
* upper plenum external wall
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10661000   1       11    2     1    0.09027   0
*
*         loc       flag
10661100  0         2
*
*         dx        int
10661101  0.00241   2
10661102  0.00483   4
10661103  0.00724   6
10661104  0.00965   8
10661105  0.03573   10
*
*        compos.    int
10661201  1         8
10661202  3         10
*
*         source    int
10661301  0.0       10
*
*        temperature flag
10661400  0
*
*         temperature pt
10661401  563.15      11
*
*         vol       inc       type      code      factor      hs
10661501  062050000 0         1         1         0.200       1
*
*         vol       inc       type      code      factor      hs
10661601 -900       0         4910        1       0.200       1
*
* source  type      mult      D-lt      D-rt      hs
10661701  0         0.0       0.0       0.0       1
*
10661800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10661801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
*
************************* STRUCTURE 0641 **************************************
* upper plenum external wall
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10641000   1       11    2     1    0.09027   0
*
*         loc       flag
10641100  0         2
*
*         dx        int
10641101  0.00241   2
10641102  0.00483   4
10641103  0.00724   6
10641104  0.00965   8
10641105  0.03573   10
*
*        compos.    int
10641201  1         8
10641202  3         10
*
*         source    int
10641301  0.0       10
*
*        temperature flag
10641400  0
*
*         temperature pt
10641401  563.15      11
*
*         vol       inc       type      code      factor      hs
10641501  064010000 0         1         1         0.200       1
*
*         vol       inc       type      code      factor      hs
10641601 -900       0         4910        1       0.200       1
*
* source  type      mult      D-lt      D-rt      hs
10641701  0         0.0       0.0       0.0       1
*
10641800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10641801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
*
************************* STRUCTURE 0628 **************************************
* upper plenum external wall
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10628000   1       11    2     1    0.08871   0
*
*         loc       flag
10628100  0         2
*
*         dx        int
10628101  0.00180   2
10628102  0.00360   4
10628103  0.00541   6
10628104  0.00721   8
10628105  0.04263   10
*
*        compos.    int
10628201  1         8
10628202  3         10
*
*         source    int
10628301  0.0       10
*
*        temperature flag
10628400  0
*
*         temperature pt
10628401  563.15      11
*
*         vol       inc       type      code      factor      hs
10628501  062080000 0         1         1         0.638       1
*
*         vol       inc       type      code      factor      hs
10628601 -900       0         4910        1       0.638       1
*
* source  type      mult      D-lt      D-rt      hs
10628701  0         0.0       0.0       0.0       1
*
10628800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10628801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
************************* STRUCTURE 0629 **************************************
* upper plenum external wall
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
```

```
10629000   3       11    2     1    0.09050   0
*
*         loc       flag
10629100  0         2
*
*         dx        int
10629101  0.00160   2
10629102  0.00320   4
10629103  0.00480   6
10629104  0.00640   8
10629105  0.04375   10
*
*        compos.    int
10629201  1         8
10629202  3         10
*
*         source    int
10629301  0.0       10
*
*        temperature flag
10629400  0
*
*         temperature pt
10629401  563.15      11
*
*         vol       inc       type      code      factor      hs
10629501  062090000 0         1         1         0.6380      1
10629502  070010000 10000     1         1         1.1975      3
*
*         vol       inc       type      code      factor      hs
10629601 -900       0         4910        1       0.6380      1
10629602 -900       0         4910        1       1.1975      3   * trancalc
*10629602  0         0         0           1       1.1975      3   * sscalc
*
* source  type      mult      D-lt      D-rt      hs
10629701  0         0.0       0.0       0.0       3
*
10629800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10629801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   4.5  1.1  1.0  1
10629802 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.4  1.1  1.0  3
*
************************* STRUCTURE 0701 *************************************
* upper head top wall
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10701000   1       11    1     1    0.0       0
*
*         loc       flag
10701100  0         2
*
*         dx        int
10701101  0.06263   2
10701102  0.12525   4
10701103  0.18788   6
10701104  0.25050   8
10701105  0.04375   10
*
*        compos.    int
10701201  1         8
10701202  3         10
*
*         source    int
10701301  0.0       10
*
*        temperature flag
10701400  0
*
*         temperature pt
10701401  563.15      11
*
*         vol       inc       type      code      factor      hs
10701501  070020000 0         1         1         0.02542     1
*
*         vol       inc       type      code      factor      hs
10701601 -900       0         4910        1       0.02542     1    * trancalc
*10701601  0         0         0           1       0.02542     1    * sscalc
*
* source  type      mult      D-lt      D-rt      hs
10701701  0         0.0       0.0       0.0       1
*
10701800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10701801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.4  1.1  1.0  1
*
************************* STRUCTURE 0631 *************************************
* hexagonal copper busbar
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10631000   1       11    2     1    0.10247   0
*
*         loc       flag
10631100  0         2
*
*         dx        int
10631101  0.00043   2
10631102  0.00086   4
10631103  0.00173   6
10631104  0.00086   8
10631105  0.00043   10
*
*        compos.    int
10631201  2         10
*
*         source    int
10631301  0.0       10
*
*        temperature flag
10631400  0
*
*         temperature pt
10631401  563.15      11
*
*         vol       inc       type      code      factor      hs
10631501  062010000 0         1         1         0.100       1
*
*         vol       inc       type      code      factor      hs
10631601  062010000 0         1           1       0.100       1
*
* source  type      mult      D-lt      D-rt      hs
10631702  0         0.0       0.0       0.0       1
*
10631800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10631801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   0.1  1.1  1.0  1
*
10631900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10631901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   0.1  1.1  1.0  1
*
************************* STRUCTURE 0632 *************************************
* copper braids
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10632000   2       9     2     1    0.0       0
*
```

```
*         loc       flag
10632100  0         2
*
*         dx        int
10632101  0.00080   2
10632102  0.00060   4
10632103  0.00040   6
10632104  0.00020   8
*
*        compos.    int
10632201  2         8
*
*         source    int
10632301  0.0       8
*
*        temperature flag
10632400  0
*
*         temperature pt
10632401  563.15      9
*
*         vol       inc       type      code      factor      hs
10632501  0         0         0         1         0.330       1
10632502  0         0         0         1         0.120       2
*
*         vol       inc       type      code      factor      hs
10632601  062010000 0         1           1       0.330       1
10632602  062020000 0         1           1       0.120       2
*
* source  type      mult      D-lt      D-rt      hs
10632702  0         0.0       0.0       0.0       2
*
10632900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10632901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   0.45 1.1  1.0  2
*
************************* STRUCTURE 0642 *************************************
* upper plenum shield cylinder
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10642000   3       11    2     1    0.07060   0
*
*         loc       flag
10642100  0         2
*
*         dx        int
10642101  0.00107   2
10642102  0.00214   4
10642103  0.00429   6
10642104  0.00214   8
10642105  0.00107   10
*
*        compos.    int
10642201  1         10
*
*         source    int
10642301  0.0       10
*
*        temperature flag
10642400  0
*
*         temperature pt
10642401  563.15      11
*
*         vol       inc       type      code      factor      hs
10642501  062060000 0         1         1         0.1239      1
10642502  062070000 0         1         1         0.1416      2
10642503  062080000 0         1         1         0.0602      3
*
*         vol       inc       type      code      factor      hs
10642601  066010000 0         1         1         0.1239      1
10642602  064010000 0         1         1         0.1416      2
10642603  062080000 0         1         1         0.0602      3
*
* source  type      mult      D-lt      D-rt      hs
10642702  0         0.0       0.0       0.0       3
*
10642800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10642801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.460 1.1  1.0  3
*
10642900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10642901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.460 1.1  1.0  3
*
************************* STRUCTURE 0702 *************************************
* upper core support plate
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10702000   1       11    1     1    0.0       0
*
*         loc       flag
10702100  0         2
*
*         dx        int
10702101  0.00150   2
10702102  0.00300   4
10702103  0.00600   6
10702104  0.00300   8
10702105  0.00150   10
*
*        compos.    int
10702201  1         10
*
*         source    int
10702301  0.0       10
*
*        temperature flag
10702400  0
*
*         temperature pt
10702401  563.15      11
*
*         vol       inc       type      code      factor      hs
10702501  062090000 0         1         1         0.02385     1
*
*         vol       inc       type      code      factor      hs
10702601  070010000 0         1         1         0.02385     1
*
* source  type      mult      D-lt      D-rt      hs
10702701  0         0.0       0.0       0.0       1
*
10702800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10702801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.2  1.1  1.0  1
*
10702900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10702901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.4  1.1  1.0  1
*
************************* STRUCTURE 0703 *************************************
* support rod
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
10703000   2       9    2     1    0.07060   0
*
```

```
*         loc       flag
10703100  0         2
*
*         dx        int
10703101  0.00200   2
10703102  0.00150   4
10703103  0.00100   6
10703104  0.00050   8
*
*        compos.    int
10703201  1         8
*
*         source    int
10703301  0.0       8
*
*        temperature flag
10703400  0
*
*         temperature pt
10703401  563.15      9
*
*         vol       inc       type      code      factor      hs
10703501  0         0         0         1         1.1675      1
10703502  0         0         0         1         1.1975      2
*
*         vol       inc       type      code      factor      hs
10703601  070010000 0         1         1         1.1675      1
10703602  070020000 0         1         1         1.1975      2
*
* source  type      mult      D-lt      D-rt      hs
10703702  0         0.0       0.0       0.0       2
*
10703900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
10703901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  2.4   1.1  1.0  2
*
************************** STRUCTURE 1011 **************************************
* hot leg nozzle and pipe in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11011000   1       11    2     1    0.03800   0
*
*         loc       flag
11011100  0         2
*
*         dx        int
11011101  0.00085   2
11011102  0.00170   4
11011103  0.00255   6
11011104  0.00340   8
11011105  0.03500   10
*
*        compos.    int
11011201  1         8
11011202  3         10
*
*         source    int
11011301  0.0       10
*
*        temperature flag
11011400  0
*
*         temperature pt
11011401  563.15      11
*
*         vol       inc       type      code      factor      hs
11011501  101010000 0         1         1         0.6683      1
*
*         vol       inc       type      code      factor      hs
11011601 -900       0         4910        1       0.6683      1
*
* source  type      mult      D-lt      D-rt      hs
11011701  0         0.0       0.0       0.0       1
*
11011800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11011801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************** STRUCTURE 1012 **************************************
* hot leg in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11012000   2       11    2     1    0.03800   0
*
*         loc       flag
11012100  0         2
*
*         dx        int
11012101  0.00080   2
11012102  0.00160   4
11012103  0.00240   6
11012104  0.00320   8
11012105  0.03550   10
*
*        compos.    int
11012201  1         8
11012202  3         10
*
*         source    int
11012301  0.0       10
*
*        temperature flag
11012400  0
*
*         temperature pt
11012401  563.15      11
*
*         vol       inc       type      code      factor      hs
11012501  101020000 10000     1         1         0.6683      2
*
*         vol       inc       type      code      factor      hs
11012601 -900       0         4910        1       0.6683      2
*
* source  type      mult      D-lt      D-rt      hs
11012701  0         0.0       0.0       0.0       2
*
11012800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11012801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  2
*
************************** STRUCTURE 1013 **************************************
* hot leg in loop 1 (loops 2 and 4 contain surge line tees)
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11013000   1       11    2     1    0.03800   0
*
*         loc       flag
11013100  0         2
*
*         dx        int
11013101  0.00080   2
11013102  0.00160   4
11013103  0.00240   6
11013104  0.00320   8
11013105  0.03550   10
*
```

```
*        compos.    int
11013201  1         8
11013202  3         10
*
*         source    int
11013301  0.0       10
*
*        temperature flag
11013400  0
*
*         temperature pt
11013401  563.15      11
*
*         vol       inc       type      code      factor      hs
11013501  101040000 0         1         1         0.420       1
*
*         vol       inc       type      code      factor      hs
11013601 -900       0         4910        1       0.420       1
*
* source  type      mult      D-lt      D-rt      hs
11013701  0         0.0       0.0       0.0       1
*
11013800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11013801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 1014 *************************************
* hot leg in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11014000   3       11    2     1    0.03800   0
*
*         loc       flag
11014100  0         2
*
*         dx        int
11014101  0.00080   2
11014102  0.00160   4
11014103  0.00240   6
11014104  0.00320   8
11014105  0.03550   10
*
*        compos.    int
11014201  1         8
11014202  3         10
*
*         source    int
11014301  0.0       10
*
*        temperature flag
11014400  0
*
*         temperature pt
11014401  563.15      11
*
*         vol       inc       type      code      factor      hs
11014501  101050000 10000     1         1         0.567       3
*
*         vol       inc       type      code      factor      hs
11014601 -900       0         4910        1       0.567       3
*
* source  type      mult      D-lt      D-rt      hs
11014701  0         0.0       0.0       0.0       3
*
11014800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11014801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.5  1.1  1.0  3
*
************************* STRUCTURE 1151 *************************************
* hot collector in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11151000   5       11    2     1    0.03649   0
*
*         loc       flag
11151100  0         2
*
*         dx        int
11151101  0.00083   2
11151102  0.00165   4
11151103  0.00331   6
11151104  0.00165   8
11151105  0.00083   10
*
*        compos.    int
11151201  1         10
*
*         source    int
11151301  0.0       10
*
*        temperature flag
11151400  0
*
*         temperature pt
11151401  563.15      11
*
*         vol       inc       type      code      factor      hs
11151501  115010000 00000     1         1         0.563       1
11151502  115020000 10000     1         1         0.476       4
11151503  115050000 00000     1         1         0.374       5
*
*         vol       inc       type      code      factor      hs
11151601  170010000 00000     1         1         0.563       1
11151602  170020000 10000     1         1         0.476       4
11151603  170050000 00000     1         1         0.374       5
*
* source  type      mult      D-lt      D-rt      hs
11151701  0         0.0       0.0       0.0       5
*
11151800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11151801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
11151900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11151901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
************************* STRUCTURE 1211 *************************************
* steam generator tubes - level 1 loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11211000   10      11    2     1    0.00650   0
*
*         loc       flag
11211100  0         2
*
*         dx        int
11211101  0.000075  2
11211102  0.000150  4
11211103  0.000300  6
11211104  0.000150  8
11211105  0.000075  10
*
*        compos.    int
11211201  1         10
*
```

```
*         source    int
11211301  0.0       10
*
*        temperature flag
11211400  0
*
*         temperature pt
11211401  563.15      11
*
*         vol       inc       type      code      factor      hs
11211501  121010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
11211601  170010000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
11211701  0         0.0       0.0       0.0       10
*
11211800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11211801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
11211802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
11211803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
11211804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
11211805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
11211806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
11211807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
11211808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
11211809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
11211810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
11211900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11211901 0.0  0.21  2.08 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 1221 *************************************
* steam generator tubes - level 2 loop 1
*===========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11221000   10      11    2     1    0.00650   0
*
*         loc       flag
11221100  1211
*
*        temperature flag
11221400  0
*
*         temperature pt
11221401  563.15      11
*
*         vol       inc       type      code      factor      hs
11221501  122010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
11221601  170020000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
11221701  0         0.0       0.0       0.0       10
*
11221800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11221801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
11221802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
11221803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
11221804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
11221805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
11221806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
11221807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
11221808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
11221809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
11221810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
11221900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11221901 0.0  0.73  1.56 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 1231 *************************************
* steam generator tubes - level 3 loop 1
*===========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11231000   10      11    2     1    0.00650   0
*
*         loc       flag
11231100  1211
*
*        temperature flag
11231400  0
*
*         temperature pt
11231401  563.15      11
*
*         vol       inc       type      code      factor      hs
11231501  123010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
11231601  170030000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
11231701  0         0.0       0.0       0.0       10
*
11231800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11231801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
11231802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
11231803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
11231804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
11231805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
11231806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
11231807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
11231808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
11231809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
11231810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
11231900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11231901 0.0  1.21  1.09 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 1241 *************************************
* steam generator tubes - level 4 loop 1
*===========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11241000   10      11    2     1    0.00650   0
*
*         loc       flag
11241100  1211
*
*        temperature flag
11241400  0
*
*         temperature pt
11241401  563.15      11
*
*         vol       inc       type      code      factor      hs
11241501  124010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
```

```
11241601  170040000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
11241701  0         0.0       0.0       0.0       10
*
11241800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11241801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
11241802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
11241803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
11241804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
11241805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
11241806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
11241807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
11241808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
11241809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
11241810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
11241900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11241901 0.0  1.68  0.61 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 1251 *************************************
* steam generator tubes - level 5 loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11251000   10      11    2     1    0.00650   0
*
*         loc       flag
11251100  1211
*
*        temperature flag
11251400  0
*
*         temperature pt
11251401  563.15      11
*
*         vol       inc       type      code      factor      hs
11251501  125010000 10000     1         1         6.3936      10
*
*         vol       inc       type      code      factor      hs
11251601  170050000 0         134       1         6.3936      10
*
* source  type      mult      D-lt      D-rt      hs
11251701  0         0.0       0.0       0.0       10
*
11251800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11251801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
11251802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
11251803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
11251804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
11251805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
11251806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
11251807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
11251808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
11251809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
11251810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
11251900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11251901 0.0  2.11  0.19 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 1291 *************************************
* cold collector in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11291000   5       11    2     1    0.03649   0
*
*         loc       flag
11291100  1151
*
*        temperature flag
11291400  0
*
*         temperature pt
11291401  563.15      11
*
*         vol       inc       type      code      factor      hs
11291501  129010000 00000     1         1         0.563       1
11291502  129020000 10000     1         1         0.476       4
11291503  129050000 00000     1         1         0.374       5
*
*         vol       inc       type      code      factor      hs
11291601  170010000 00000     1         1         0.563       1
11291602  170020000 10000     1         1         0.476       4
11291603  170050000 00000     1         1         0.374       5
*
* source  type      mult      D-lt      D-rt      hs
11291701  0         0.0       0.0       0.0       5
*
11291800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11291801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
11291900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11291901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
************************* STRUCTURE 1351 *************************************
* pump suction piping in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11351000   13      11    2     1    0.03800   0
*
*         loc       flag
11351100  0         2
*
*         dx        int
11351101  0.00080   2
11351102  0.00160   4
11351103  0.00240   6
11351104  0.00320   8
11351105  0.03550   10
*
*        compos.    int
11351201  1         8
11351202  3         10
*
*         source    int
11351301  0.0       10
*
*        temperature flag
11351400  0
*
*         temperature pt
11351401  563.15      11
*
*         vol       inc       type      code      factor      hs
11351501  135010000 10000     1         1         0.828       5
11351502  135060000 10000     1         1         1.042       7
11351503  135080000 00000     1         1         1.121       8
11351504  135090000 10000     1         1         0.7495      10
11351505  135120000 10000     1         1         0.74525     13
*
*         vol       inc       type      code      factor      hs
```

```
11351601 -900       0         4910        1       0.828       5
11351602 -900       0         4910        1       1.042       7
11351603 -900       0         4910        1       1.121       8
11351604 -900       0         4910        1       0.7495      10
11351605 -900       0         4910        1       0.74525     13
*
* source  type      mult      D-lt      D-rt      hs
11351701  0         0.0       0.0       0.0       13
*
11351800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11351801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   6.6  1.1  1.0  8
11351802 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  10
11351803 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  13
*
************************* STRUCTURE 1352 *************************************
* pump suction piping and filter in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11352000   1       11    2     1    0.05912   0
*
*         loc       flag
11352100  0         2
*
*         dx        int
11352101  0.00245   2
11352102  0.00489   4
11352103  0.00734   6
11352104  0.00979   8
11352105  0.03550   10
*
*        compos.    int
11352201  1         8
11352202  3         10
*
*         source    int
11352301  0.0       10
*
*        temperature flag
11352400  0
*
*         temperature pt
11352401  563.15      11
*
*         vol       inc       type      code      factor      hs
11352501  135110000 00000     1         1         0.74525     1
*
*         vol       inc       type      code      factor      hs
11352601 -900       0         4910        1       0.74525     1
*
* source  type      mult      D-lt      D-rt      hs
11352701  0         0.0       0.0       0.0       1
*
11352800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11352801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  1
*
************************* STRUCTURE 1401 *************************************
* main coolant pump in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11401000   1       9     2     1    0.06532   0
*
*         loc       flag
11401100  0         2
*
*         dx        int
11401101  0.00757   2
11401102  0.01513   4
11401103  0.02270   6
11401104  0.03027   8
*
*        compos.    int
11401201  1         8
*
*         source    int
11401301  0.0       8
*
*        temperature flag
11401400  0
*
*         temperature pt
11401401  563.15      9
*
*         vol       inc       type      code      factor      hs
11401501  140010000 00000     1         1         0.746       1
*
*         vol       inc       type      code      factor      hs
11401601 -900       0         4911        1       0.746       1
*
* source  type      mult      D-lt      D-rt      hs
11401701  0         0.0       0.0       0.0       1
*
11401800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11401801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  1
*
************************* STRUCTURE 1421 *************************************
* cold leg isolation valve in loop 1
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11421000   1       11    2     1    0.04355   0
*
*         loc       flag
11421100  0         2
*
*         dx        int
11421101  0.00352   2
11421102  0.00704   4
11421103  0.01056   6
11421104  0.01407   8
11421105  0.03550   10
*
*        compos.    int
11421201  1         8
11421202  3         10
*
*         source    int
11421301  0.0       10
*
*        temperature flag
11421400  0
*
*         temperature pt
11421401  563.15      11
*
*         vol       inc       type      code      factor      hs
11421501  142010000 00000     1         1         0.880       1
*
*         vol       inc       type      code      factor      hs
11421601 -900       0         4910        1       0.880       1
*
* source  type      mult      D-lt      D-rt      hs
11421701  0         0.0       0.0       0.0       1
*
11421800    1
```

```
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11421801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 1451 *************************************
* cold leg in loop 1
*===========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11451000   4       11    2     1    0.03800   0
*
*         loc       flag
11451100  0         2
*
*         dx        int
11451101  0.00080   2
11451102  0.00160   4
11451103  0.00240   6
11451104  0.00320   8
11451105  0.03550   10
*
*        compos.    int
11451201  1         8
11451202  3         10
*
*         source    int
11451301  0.0       10
*
*        temperature flag
11451400  0
*
*         temperature pt
11451401  563.15      11
*
*         vol       inc       type      code      factor      hs
11451501  145010000 10000     1         1         0.782       3
11451502  145040000 00000     1         1         0.741       4
*
*         vol       inc       type      code      factor      hs
11451601 -900       0         4910        1       0.782       3
11451602 -900       0         4910        1       0.741       4
*
* source  type      mult      D-lt      D-rt      hs
11451701  0         0.0       0.0       0.0       4
*
11451800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11451801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  4
*
************************* STRUCTURE 1591 *************************************
* feedwater header for loop 1
*===========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11591000   1       11    2     1    0.07456   0
*
*         loc       flag
11591100  0         2
*
*         dx        int
11591101  0.00033   2
11591102  0.00066   4
11591103  0.00133   6
11591104  0.00066   8
11591105  0.00033   10
*
*        compos.    int
11591201  1         10
*
*         source    int
11591301  0.0       10
*
*        temperature flag
11591400  0
*
*         temperature pt
11591401  563.15      11
*
*         vol       inc       type      code      factor      hs
11591501  159010000 00000     1         1         0.2924      1
*
*         vol       inc       type      code      factor      hs
11591601  172010000 0         1         1         0.2924      1
*
* source  type      mult      D-lt      D-rt      hs
11591701  0         0.0       0.0       0.0       1
*
11591800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11591801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.034 1.1  1.0  1
*
11591900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11591901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.012 1.1  1.0  1
*
************************* STRUCTURE 1601 *************************************
* lower steam generator housing for loop 1
*===========================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11601000   1       11    2     1    0.2200    0
*
*         loc       flag
11601100  0         2
*
*         dx        int
11601101  0.00793   2
11601102  0.01585   4
11601103  0.02378   6
11601104  0.03170   8
11601105  0.04500   10
*
*        compos.    int
11601201  1         8
11601202  7         10
*
*         source    int
11601301  0.0       10
*
*        temperature flag
11601400  0
*
*         temperature pt
11601401  563.15      11
*
*         vol       inc       type      code      factor      hs
11601501  170010000 00000     1         1         0.563       1
*
*         vol       inc       type      code      factor      hs
11601601 -900       0         4913      1         0.563       1
*
* source  type      mult      D-lt      D-rt      hs
11601701  0         0.0       0.0       0.0       1
*
11601800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11601801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   3.9  1.1  1.0  1
*
************************* STRUCTURE 1602 *************************************
* upper steam generator housing for loop 1
```

```
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11602000   7       11    2     1    0.2200    0
*
*         loc       flag
11602100  0         2
*
*         dx        int
11602101  0.00200   2
11602102  0.00400   4
11602103  0.00600   6
11602104  0.00800   8
11602105  0.04500   10
*
*        compos.    int
11602201  1         8
11602202  7         10
*
*         source    int
11602301  0.0       10
*
*        temperature flag
11602400  0
*
*         temperature pt
11602401  563.15      11
*
*         vol       inc       type      code      factor      hs
11602501  170020000 10000     1         1         0.476       3
11602502  170050000 00000     1         1         0.374       4
11602503  172010000 00000     1         1         0.630       5
11602504  175010000 10000     1         1         0.470       7
*
*         vol       inc       type      code      factor      hs
11602601 -900       0         4913      1         0.476       3
11602602 -900       0         4913      1         0.374       4
11602603 -900       0         4913      1         0.630       5
11602604 -900       0         4913      1         0.470       7
*
* source  type      mult      D-lt      D-rt      hs
11602701  0         0.0       0.0       0.0       7
*
11602800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11602801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   3.9  1.1  1.0  7
*
************************* STRUCTURE 1603 **************************************
* upper head for steam generator housing for loop 1
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11603000   1       11    1     1    0.0000    0
*
*         loc       flag
11603100  0         2
*
*         dx        int
11603101  0.00456   2
11603102  0.00913   4
11603103  0.01369   6
11603104  0.01825   8
11603105  0.04500   10
*
*        compos.    int
11603201  1         8
11603202  7         10
*
*         source    int
11603301  0.0       10
*
*        temperature flag
11603400  0
*
*         temperature pt
11603401  563.15      11
*
*         vol       inc       type      code      factor      hs
11603501  175020000 00000     1         1         0.14941     1
*
*         vol       inc       type      code      factor      hs
11603601 -900       0         4913      1         0.14941     1
*
* source  type      mult      D-lt      D-rt      hs
11603701  0         0.0       0.0       0.0       1
*
11603800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11603801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   0.11 1.1  1.0  1
*
************************* STRUCTURE 1701 **************************************
* lower head of the steam generator housing for loop 1
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
11701000   2       11    2     1    0.6691    0
*
*         loc       flag
11701100  0         2
*
*         dx        int
11701101  0.02926   2
11701102  0.05853   4
11701103  0.11705   6
11701104  0.05853   8
11701105  0.02926   10
*
*        compos.    int
11701201  1         10
*
*         source    int
11701301  0.0       10
*
*        temperature flag
11701400  0
*
*         temperature pt
11701401  563.15      11
*
*         vol       inc       type      code      factor      hs
11701501  110010000 20000000  1         1         0.01701     2
*
*         vol       inc       type      code      factor      hs
11701601  170010000 0         1         1         0.01701     2
*
* source  type      mult      D-lt      D-rt      hs
11701701  0         0.0       0.0       0.0       2
*
11701800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11701801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.200 1.1  1.0  2
*
11701900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
11701901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.11  1.1  1.0  2
*
************************* STRUCTURE 2011 **************************************
* hot leg nozzle and pipe in loop 2
*==============================================================================$
```

```
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12011000   1      11    2     1    0.03800   0
*
*         loc       flag
12011100  0         2
*
*         dx        int
12011101  0.00085   2
12011102  0.00170   4
12011103  0.00255   6
12011104  0.00340   8
12011105  0.03500   10
*
*        compos.    int
12011201  1         8
12011202  3         10
*
*         source    int
12011301  0.0       10
*
*        temperature flag
12011400  0
*
*         temperature pt
12011401  563.15      11
*
*         vol       inc       type      code      factor      hs
12011501  201010000 0         1         1         0.6683      1
*
*         vol       inc       type      code      factor      hs
12011601 -900       0         4910        1       0.6683      1
*
* source  type      mult      D-lt      D-rt      hs
12011701  0         0.0       0.0       0.0       1
*
12011800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12011801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 2012 **************************************
* hot leg in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12012000   2      11    2     1    0.03800   0
*
*         loc       flag
12012100  0         2
*
*         dx        int
12012101  0.00080   2
12012102  0.00160   4
12012103  0.00240   6
12012104  0.00320   8
12012105  0.03550   10
*
*        compos.    int
12012201  1         8
12012202  3         10
*
*         source    int
12012301  0.0       10
*
*        temperature flag
12012400  0
*
*         temperature pt
12012401  563.15      11
*
*         vol       inc       type      code      factor      hs
12012501  201020000 10000     1         1         0.6683      2
*
*         vol       inc       type      code      factor      hs
12012601 -900       0         4910        1       0.6683      2
*
* source  type      mult      D-lt      D-rt      hs
12012701  0         0.0       0.0       0.0       2
*
12012800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12012801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  2
*
************************* STRUCTURE 2013 **************************************
* surge line nozzle and hot leg in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12013000   1      11    2     1    0.03800   0
*
*         loc       flag
12013100  0         2
*
*         dx        int
12013101  0.00088   2
12013102  0.00176   4
12013103  0.00264   6
12013104  0.00352   8
12013105  0.03470   10
*
*        compos.    int
12013201  1         8
12013202  3         10
*
*         source    int
12013301  0.0       10
*
*        temperature flag
12013400  0
*
*         temperature pt
12013401  563.15      11
*
*         vol       inc       type      code      factor      hs
12013501  201040000 0         1         1         0.420       1
*
*         vol       inc       type      code      factor      hs
12013601 -900       0         4910        1       0.420       1
*
* source  type      mult      D-lt      D-rt      hs
12013701  0         0.0       0.0       0.0       1
*
12013800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12013801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 2014 **************************************
* hot leg in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12014000   3      11    2     1    0.03800   0
*
*         loc       flag
12014100  0         2
*
*         dx        int
12014101  0.00080   2
12014102  0.00160   4
12014103  0.00240   6
```

```
12014104  0.00320   8
12014105  0.03550   10
*
*        compos.    int
12014201  1         8
12014202  3         10
*
*         source    int
12014301  0.0       10
*
*        temperature flag
12014400  0
*
*         temperature pt
12014401  563.15      11
*
*         vol       inc       type      code      factor      hs
12014501  201050000 10000     1         1         0.567       3
*
*         vol       inc       type      code      factor      hs
12014601 -900       0         4910        1       0.567       3
*
* source  type      mult      D-lt      D-rt      hs
12014701  0         0.0       0.0       0.0       3
*
12014800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12014801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.5  1.1  1.0  3
*
************************* STRUCTURE 2151 *************************************
* hot collector in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12151000   5       11    2     1    0.03649   0
*
*         loc       flag
12151100  1151
*
*        temperature flag
12151400  0
*
*         temperature pt
12151401  563.15      11
*
*         vol       inc       type      code      factor      hs
12151501  215010000 00000     1         1         0.563       1
12151502  215020000 10000     1         1         0.476       4
12151503  215050000 00000     1         1         0.374       5
*
*         vol       inc       type      code      factor      hs
12151601  270010000 00000     1         1         0.563       1
12151602  270020000 10000     1         1         0.476       4
12151603  270050000 00000     1         1         0.374       5
*
* source  type      mult      D-lt      D-rt      hs
12151701  0         0.0       0.0       0.0       5
*
12151800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12151801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
12151900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12151901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
************************* STRUCTURE 2211 *************************************
* steam generator tubes - level 1 loop 2
*============================================================================$
```

```
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12211000   10      11    2     1    0.00650   0
*
*         loc       flag
12211100  0         2
*
*         dx        int
12211101  0.000075  2
12211102  0.000150  4
12211103  0.000300  6
12211104  0.000150  8
12211105  0.000075  10
*
*        compos.    int
12211201  1         10
*
*         source    int
12211301  0.0       10
*
*        temperature flag
12211400  0
*
*         temperature pt
12211401  563.15      11
*
*         vol       inc       type      code      factor      hs
12211501  221010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
12211601  270010000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
12211701  0         0.0       0.0       0.0       10
*
12211800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12211801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
12211802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
12211803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
12211804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
12211805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
12211806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
12211807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
12211808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
12211809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
12211810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
12211900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12211901 0.0  0.21  2.08 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 2221 *************************************
* steam generator tubes - level 2 loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12221000   10      11    2     1    0.00650   0
*
*         loc       flag
12221100  1211
*
*        temperature flag
12221400  0
*
*         temperature pt
12221401  563.15      11
*
*         vol       inc       type      code      factor      hs
12221501  222010000 10000     1         1         7.4592      10
```

```
*
*         vol       inc       type      code      factor      hs
12221601  270020000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
12221701  0         0.0       0.0       0.0       10
*
12221800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12221801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
12221802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
12221803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
12221804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
12221805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
12221806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
12221807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
12221808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
12221809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
12221810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
12221900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12221901 0.0  0.73  1.56 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 2231 *************************************
* steam generator tubes - level 3 loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12231000   10      11    2     1    0.00650   0
*
*         loc       flag
12231100  1211
*
*        temperature flag
12231400  0
*
*         temperature pt
12231401  563.15      11
*
*         vol       inc       type      code      factor      hs
12231501  223010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
12231601  270030000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
12231701  0         0.0       0.0       0.0       10
*
12231800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12231801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
12231802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
12231803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
12231804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
12231805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
12231806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
12231807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
12231808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
12231809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
12231810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
12231900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12231901 0.0  1.21  1.09 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 2241 *************************************
* steam generator tubes - level 4 loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12241000   10      11    2     1    0.00650   0
*
*         loc       flag
12241100  1211
*
*        temperature flag
12241400  0
*
*         temperature pt
12241401  563.15      11
*
*         vol       inc       type      code      factor      hs
12241501  224010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
12241601  270040000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
12241701  0         0.0       0.0       0.0       10
*
12241800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12241801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
12241802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
12241803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
12241804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
12241805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
12241806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
12241807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
12241808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
12241809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
12241810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
12241900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12241901 0.0  1.68  0.61 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 2251 *************************************
* steam generator tubes - level 5 loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12251000   10      11    2     1    0.00650   0
*
*         loc       flag
12251100  1211
*
*        temperature flag
12251400  0
*
*         temperature pt
12251401  563.15      11
*
*         vol       inc       type      code      factor      hs
12251501  225010000 10000     1         1         6.3936      10
*
*         vol       inc       type      code      factor      hs
12251601  270050000 0         134       1         6.3936      10
*
* source  type      mult      D-lt      D-rt      hs
12251701  0         0.0       0.0       0.0       10
*
12251800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12251801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
12251802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
12251803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
12251804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
```

```
12251805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
12251806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
12251807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
12251808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
12251809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
12251810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
12251900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12251901 0.0  2.11  0.19 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************** STRUCTURE 2291 **************************************
* cold collector in loop 2
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12291000   5       11    2     1    0.03649   0
*
*         loc       flag
12291100  1151
*
*        temperature flag
12291400  0
*
*         temperature pt
12291401  563.15      11
*
*         vol       inc       type      code      factor      hs
12291501  229010000 00000     1         1         0.563       1
12291502  229020000 10000     1         1         0.476       4
12291503  229050000 00000     1         1         0.374       5
*
*         vol       inc       type      code      factor      hs
12291601  270010000 00000     1         1         0.563       1
12291602  270020000 10000     1         1         0.476       4
12291603  270050000 00000     1         1         0.374       5
*
* source  type      mult      D-lt      D-rt      hs
12291701  0         0.0       0.0       0.0       5
*
12291800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12291801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
12291900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12291901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
************************** STRUCTURE 2351 **************************************
* pump suction piping in loop 2
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12351000   13      11    2     1    0.03800   0
*
*         loc       flag
12351100  0         2
*
*         dx        int
12351101  0.00080   2
12351102  0.00160   4
12351103  0.00240   6
12351104  0.00320   8
12351105  0.03550   10
*
*        compos.    int
12351201  1         8
12351202  3         10
*
*         source    int
```

```
12351301  0.0       10
*
*        temperature flag
12351400  0
*
*         temperature pt
12351401  563.15      11
*
*         vol       inc       type      code      factor      hs
12351501  235010000 10000     1         1         0.828       5
12351502  235060000 10000     1         1         1.042       7
12351503  235080000 00000     1         1         1.136       8
12351504  235090000 10000     1         1         0.7495      10
12351505  235120000 10000     1         1         0.749       13
*
*         vol       inc       type      code      factor      hs
12351601 -900       0         4910        1       0.828       5
12351602 -900       0         4910        1       1.042       7
12351603 -900       0         4910        1       1.136       8
12351604 -900       0         4910        1       0.7495      10
12351605 -900       0         4910        1       0.749       13
*
* source  type      mult      D-lt      D-rt      hs
12351701  0         0.0       0.0       0.0       13
*
12351800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12351801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   6.6  1.1  1.0  8
12351802 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  10
12351803 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  13
*
************************** STRUCTURE 2352 **************************************
* pump suction piping and filter in loop 2
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12352000   1       11    2     1    0.05902   0
*
*         loc       flag
12352100  0         2
*
*         dx        int
12352101  0.00244   2
12352102  0.00488   4
12352103  0.00732   6
12352104  0.00976   8
12352105  0.03550   10
*
*        compos.    int
12352201  1         8
12352202  3         10
*
*         source    int
12352301  0.0       10
*
*        temperature flag
12352400  0
*
*         temperature pt
12352401  563.15      11
*
*         vol       inc       type      code      factor      hs
12352501  235110000 00000     1         1         0.749       1
*
*         vol       inc       type      code      factor      hs
12352601 -900       0         4910        1       0.749       1
*
* source  type      mult      D-lt      D-rt      hs
12352701  0         0.0       0.0       0.0       1
```

```
*
12352800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12352801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  1
*
************************* STRUCTURE 2401 *************************************
* main coolant pump in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12401000   1       9     2     1    0.06532   0
*
*         loc       flag
12401100  1401
*
*        temperature flag
12401400  0
*
*         temperature pt
12401401  563.15      9
*
*         vol       inc       type      code      factor      hs
12401501  240010000 00000     1         1         0.746       1
*
*         vol       inc       type      code      factor      hs
12401601 -900       0         4911        1       0.746       1
*
* source  type      mult      D-lt      D-rt      hs
12401701  0         0.0       0.0       0.0       1
*
12401800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12401801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  1
*
************************* STRUCTURE 2421 *************************************
* cold leg isolation valve in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12421000   1      11     2     1    0.04355   0
*
*         loc       flag
12421100  0         2
*
*         dx        int
12421101  0.00352   2
12421102  0.00704   4
12421103  0.01056   6
12421104  0.01407   8
12421105  0.03550   10
*
*        compos.    int
12421201  1         8
12421202  3         10
*
*         source    int
12421301  0.0       10
*
*        temperature flag
12421400  0
*
*         temperature pt
12421401  563.15      11
*
*         vol       inc       type      code      factor      hs
12421501  242010000 00000     1         1         0.880       1
*
*         vol       inc       type      code      factor      hs
12421601 -900       0         4910        1       0.880       1
*
* source  type      mult      D-lt      D-rt      hs
12421701  0         0.0       0.0       0.0       1
*
12421800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12421801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 2451 *************************************
* cold leg in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12451000   4      11     2     1    0.03800   0
*
*         loc       flag
12451100  0         2
*
*         dx        int
12451101  0.00080   2
12451102  0.00160   4
12451103  0.00240   6
12451104  0.00320   8
12451105  0.03550   10
*
*        compos.    int
12451201  1         8
12451202  3         10
*
*         source    int
12451301  0.0       10
*
*        temperature flag
12451400  0
*
*         temperature pt
12451401  563.15      11
*
*         vol       inc       type      code      factor      hs
12451501  245010000 10000     1         1         0.782       3
12451502  245030000 00000     1         1         0.741       4
*
*         vol       inc       type      code      factor      hs
12451601 -900       0         4910        1       0.782       3
12451602 -900       0         4910        1       0.741       4
*
* source  type      mult      D-lt      D-rt      hs
12451701  0         0.0       0.0       0.0       4
*
12451800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12451801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  4
*
************************* STRUCTURE 2591 *************************************
* feedwater header for loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12591000   1      11     2     1    0.07456   0
*
*         loc       flag
12591100  1591      2
*
*        temperature flag
12591400  0
*
*         temperature pt
12591401  563.15      11
*
*         vol       inc       type      code      factor      hs
12591501  259010000 00000     1         1         0.2924      1
```

```
*
*         vol       inc       type      code      factor      hs
12591601  272010000 0         1         1         0.2924      1
*
* source  type      mult      D-lt      D-rt      hs
12591701  0         0.0       0.0       0.0       1
*
12591800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12591801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.034 1.1  1.0  1
*
12591900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12591901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.012 1.1  1.0  1
*
************************* STRUCTURE 2601 *************************************
* lower steam generator housing for loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12601000   1       11    2     1    0.2200    0
*
*         loc       flag
12601100  1601
*
*        temperature flag
12601400  0
*
*         temperature pt
12601401  563.15      11
*
*         vol       inc       type      code      factor      hs
12601501  270010000 00000     1         1         0.563       1
*
*         vol       inc       type      code      factor      hs
12601601 -900       0         4913      1         0.563       1
*
* source  type      mult      D-lt      D-rt      hs
12601701  0         0.0       0.0       0.0       1
*
12601800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12601801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   3.9  1.1  1.0  1
*
************************* STRUCTURE 2602 *************************************
* upper steam generator housing for loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12602000   7       11    2     1    0.2200    0
*
*         loc       flag
12602100  1602      2
*
*        temperature flag
12602400  0
*
*         temperature pt
12602401  563.15      11
*
*         vol       inc       type      code      factor      hs
12602501  270020000 10000     1         1         0.476       3
12602502  270050000 00000     1         1         0.374       4
12602503  272010000 00000     1         1         0.630       5
12602504  275010000 10000     1         1         0.470       7
*
*         vol       inc       type      code      factor      hs
12602601 -900       0         4913      1         0.476       3
12602602 -900       0         4913      1         0.374       4
12602603 -900       0         4913      1         0.630       5
12602604 -900       0         4913      1         0.470       7
*
* source  type      mult      D-lt      D-rt      hs
12602701  0         0.0       0.0       0.0       7
*
12602800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12602801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   3.9  1.1  1.0  7
*
************************* STRUCTURE 2603 *************************************
* upper head for steam generator housing for loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12603000   1       11    1     1    0.0000    0
*
*         loc       flag
12603100  1603      2
*
*        temperature flag
12603400  0
*
*         temperature pt
12603401  563.15      11
*
*         vol       inc       type      code      factor      hs
12603501  275020000 00000     1         1         0.14941     1
*
*         vol       inc       type      code      factor      hs
12603601 -900       0         4913      1         0.14941     1
*
* source  type      mult      D-lt      D-rt      hs
12603701  0         0.0       0.0       0.0       1
*
12603800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12603801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   0.11 1.1  1.0  1
*
************************* STRUCTURE 2701 *************************************
* lower head of the steam generator housing for loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
12701000   2       11    2     1    0.6691    0
*
*         loc       flag
12701100  1701
*
*        temperature flag
12701400  0
*
*         temperature pt
12701401  563.15      11
*
*         vol       inc       type      code      factor      hs
12701501  210010000 20000000  1         1         0.01701     2
*
*         vol       inc       type      code      factor      hs
12701601  270010000 0         1         1         0.01701     2
*
* source  type      mult      D-lt      D-rt      hs
12701701  0         0.0       0.0       0.0       2
*
12701800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12701801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.200 1.1  1.0  2
*
12701900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
12701901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.11  1.1  1.0  2
```

```
*
************************* STRUCTURE 3011 **************************************
* hot leg nozzle and pipe in loop 3
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13011000   1      11    2     1    0.03800   0
*
*         loc       flag
13011100  0         2
*
*         dx        int
13011101  0.00085   2
13011102  0.00170   4
13011103  0.00255   6
13011104  0.00340   8
13011105  0.03500   10
*
*        compos.    int
13011201  1         8
13011202  3         10
*
*         source    int
13011301  0.0       10
*
*        temperature flag
13011400  0
*
*         temperature pt
13011401  563.15      11
*
*         vol       inc       type      code      factor      hs
13011501  301010000 0         1         1         0.6683      1
*
*         vol       inc       type      code      factor      hs
13011601 -900       0         4910        1       0.6683      1
*
* source  type      mult      D-lt      D-rt      hs
13011701  0         0.0       0.0       0.0       1
*
13011800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13011801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 3012 **************************************
* hot leg in loop 3
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13012000   2      11    2     1    0.03800   0
*
*         loc       flag
13012100  0         2
*
*         dx        int
13012101  0.00080   2
13012102  0.00160   4
13012103  0.00240   6
13012104  0.00320   8
13012105  0.03550   10
*
*        compos.    int
13012201  1         8
13012202  3         10
*
*         source    int
13012301  0.0       10
*
*        temperature flag
13012400  0
*
*         temperature pt
13012401  563.15      11
*
*         vol       inc       type      code      factor      hs
13012501  301020000 10000     1         1         0.6683      2
*
*         vol       inc       type      code      factor      hs
13012601 -900       0         4910        1       0.6683      2
*
* source  type      mult      D-lt      D-rt      hs
13012701  0         0.0       0.0       0.0       2
*
13012800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13012801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  2
*
************************* STRUCTURE 3013 **************************************
* hot leg in loop 3 (loops 2 and 4 contain surge line tees)
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13013000   1      11    2     1    0.03800   0
*
*         loc       flag
13013100  0         2
*
*         dx        int
13013101  0.00080   2
13013102  0.00160   4
13013103  0.00240   6
13013104  0.00320   8
13013105  0.03550   10
*
*        compos.    int
13013201  1         8
13013202  3         10
*
*         source    int
13013301  0.0       10
*
*        temperature flag
13013400  0
*
*         temperature pt
13013401  563.15      11
*
*         vol       inc       type      code      factor      hs
13013501  301040000 0         1         1         0.420       1
*
*         vol       inc       type      code      factor      hs
13013601 -900       0         4910        1       0.420       1
*
* source  type      mult      D-lt      D-rt      hs
13013701  0         0.0       0.0       0.0       1
*
13013800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13013801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 3014 **************************************
* hot leg in loop 3
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13014000   3      11    2     1    0.03800   0
*
*         loc       flag
13014100  0         2
*
```

```
*         dx        int
13014101  0.00080   2
13014102  0.00160   4
13014103  0.00240   6
13014104  0.00320   8
13014105  0.03550   10
*
*        compos.    int
13014201  1         8
13014202  3         10
*
*         source    int
13014301  0.0       10
*
*        temperature flag
13014400  0
*
*         temperature pt
13014401  563.15      11
*
*         vol       inc       type      code      factor      hs
13014501  301050000 10000     1         1         0.567       3
*
*         vol       inc       type      code      factor      hs
13014601 -900       0         4910        1       0.567       3
*
* source  type      mult      D-lt      D-rt      hs
13014701  0         0.0       0.0       0.0       3
*
13014800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13014801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.5  1.1  1.0  3
*
************************* STRUCTURE 3151 *************************************
* hot collector in loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13151000   5       11    2     1    0.03649   0
*
*         loc       flag
13151100  1151
*
*        temperature flag
13151400  0
*
*         temperature pt
13151401  563.15      11
*
*         vol       inc       type      code      factor      hs
13151501  315010000 00000     1         1         0.563       1
13151502  315020000 10000     1         1         0.476       4
13151503  315050000 00000     1         1         0.374       5
*
*         vol       inc       type      code      factor      hs
13151601  370010000 00000     1         1         0.563       1
13151602  370020000 10000     1         1         0.476       4
13151603  370050000 00000     1         1         0.374       5
*
* source  type      mult      D-lt      D-rt      hs
13151701  0         0.0       0.0       0.0       5
*
13151800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13151801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
13151900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13151901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
```



```
*
************************* STRUCTURE 3211 *************************************
* steam generator tubes - level 1 loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13211000   10      11    2     1    0.00650   0
*
*         loc       flag
13211100  0         2
*
*         dx        int
13211101  0.000075  2
13211102  0.000150  4
13211103  0.000300  6
13211104  0.000150  8
13211105  0.000075  10
*
*        compos.    int
13211201  1         10
*
*         source    int
13211301  0.0       10
*
*        temperature flag
13211400  0
*
*         temperature pt
13211401  563.15      11
*
*         vol       inc       type      code      factor      hs
13211501  321010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
13211601  370010000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
13211701  0         0.0       0.0       0.0       10
*
13211800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13211801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
13211802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
13211803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
13211804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
13211805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
13211806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
13211807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
13211808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
13211809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
13211810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
13211900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13211901 0.0  0.21  2.08 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 3221 *************************************
* steam generator tubes - level 2 loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13221000   10      11    2     1    0.00650   0
*
*         loc       flag
13221100  1211
*
*        temperature flag
13221400  0
*
*         temperature pt
```

```
13221401  563.15      11
*
*         vol       inc       type      code      factor      hs
13221501  322010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
13221601  370020000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
13221701  0         0.0       0.0       0.0       10
*
13221800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13221801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
13221802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
13221803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
13221804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
13221805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
13221806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
13221807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
13221808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
13221809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
13221810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
13221900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13221901 0.0  0.73  1.56 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 3231 **************************************
* steam generator tubes - level 3 loop 3
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13231000   10      11    2     1    0.00650   0
*
*         loc       flag
13231100  1211
*
*        temperature flag
13231400  0
*
*         temperature pt
13231401  563.15      11
*
*         vol       inc       type      code      factor      hs
13231501  323010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
13231601  370030000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
13231701  0         0.0       0.0       0.0       10
*
13231800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13231801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
13231802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
13231803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
13231804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
13231805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
13231806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
13231807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
13231808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
13231809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
13231810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
13231900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13231901 0.0  1.21  1.09 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
```

```
*
************************* STRUCTURE 3241 **************************************
* steam generator tubes - level 4 loop 3
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13241000   10      11    2     1    0.00650   0
*
*         loc       flag
13241100  1211
*
*        temperature flag
13241400  0
*
*         temperature pt
13241401  563.15      11
*
*         vol       inc       type      code      factor      hs
13241501  324010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
13241601  370040000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
13241701  0         0.0       0.0       0.0       10
*
13241800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13241801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
13241802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
13241803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
13241804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
13241805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
13241806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
13241807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
13241808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
13241809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
13241810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
13241900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13241901 0.0  1.68  0.61 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 3251 **************************************
* steam generator tubes - level 5 loop 3
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13251000   10      11    2     1    0.00650   0
*
*         loc       flag
13251100  1211
*
*        temperature flag
13251400  0
*
*         temperature pt
13251401  563.15      11
*
*         vol       inc       type      code      factor      hs
13251501  325010000 10000     1         1         6.3936      10
*
*         vol       inc       type      code      factor      hs
13251601  370050000 0         134       1         6.3936      10
*
* source  type      mult      D-lt      D-rt      hs
13251701  0         0.0       0.0       0.0       10
*
13251800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
```

```
13251801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
13251802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
13251803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
13251804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
13251805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
13251806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
13251807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
13251808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
13251809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
13251810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
13251900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13251901 0.0  2.11  0.19 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 3291 *************************************
* cold collector in loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13291000   5       11    2     1    0.03649   0
*
*         loc       flag
13291100  1151
*
*        temperature flag
13291400  0
*
*         temperature pt
13291401  563.15      11
*
*         vol       inc       type      code      factor      hs
13291501  329010000 00000     1         1         0.563       1
13291502  329020000 10000     1         1         0.476       4
13291503  329050000 00000     1         1         0.374       5
*
*         vol       inc       type      code      factor      hs
13291601  370010000 00000     1         1         0.563       1
13291602  370020000 10000     1         1         0.476       4
13291603  370050000 00000     1         1         0.374       5
*
* source  type      mult      D-lt      D-rt      hs
13291701  0         0.0       0.0       0.0       5
*
13291800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13291801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
13291900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13291901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
************************* STRUCTURE 3351 *************************************
* pump suction piping in loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13351000   13      11    2     1    0.03800   0
*
*         loc       flag
13351100  0         2
*
*         dx        int
13351101  0.00080   2
13351102  0.00160   4
13351103  0.00240   6
13351104  0.00320   8
13351105  0.03550   10
*
*        compos.    int
13351201  1         8
13351202  3         10
*
*         source    int
13351301  0.0       10
*
*        temperature flag
13351400  0
*
*         temperature pt
13351401  563.15      11
*
*         vol       inc       type      code      factor      hs
13351501  335010000 10000     1         1         0.828       5
13351502  335060000 10000     1         1         1.042       7
13351503  335080000 00000     1         1         1.151       8
13351504  335090000 10000     1         1         0.7495      10
13351505  335120000 10000     1         1         0.75275     13
*
*         vol       inc       type      code      factor      hs
13351601 -900       0         4910        1       0.828       5
13351602 -900       0         4910        1       1.042       7
13351603 -900       0         4910        1       1.151       8
13351604 -900       0         4910        1       0.7495      10
13351605 -900       0         4910        1       0.75275     13
*
* source  type      mult      D-lt      D-rt      hs
13351701  0         0.0       0.0       0.0       13
*
13351800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13351801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   6.6  1.1  1.0  8
13351802 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  10
13351803 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  13
*
************************* STRUCTURE 3352 *************************************
* pump suction piping and filter in loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13352000   1       11    2     1    0.05891   0
*
*         loc       flag
13352100  0         2
*
*         dx        int
13352101  0.00244   2
13352102  0.00487   4
13352103  0.00731   6
13352104  0.00974   8
13352105  0.03550   10
*
*        compos.    int
13352201  1         8
13352202  3         10
*
*         source    int
13352301  0.0       10
*
*        temperature flag
13352400  0
*
*         temperature pt
13352401  563.15      11
*
*         vol       inc       type      code      factor      hs
13352501  335110000 00000     1         1         0.75275     1
*
*         vol       inc       type      code      factor      hs
```

```
13352601 -900       0         4910        1       0.75275     1
*
* source  type      mult      D-lt      D-rt      hs
13352701  0         0.0       0.0       0.0       1
*
13352800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13352801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  1
*
************************* STRUCTURE 3401 *************************************
* main coolant pump in loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13401000   1       9     2     1    0.06532   0
*
*         loc       flag
13401100  1401
*
*        temperature flag
13401400  0
*
*         temperature pt
13401401  563.15      9
*
*         vol       inc       type      code      factor      hs
13401501  340010000 00000     1         1         0.746       1
*
*         vol       inc       type      code      factor      hs
13401601 -900       0         4911        1       0.746       1
*
* source  type      mult      D-lt      D-rt      hs
13401701  0         0.0       0.0       0.0       1
*
13401800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13401801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  1
*
************************* STRUCTURE 3421 *************************************
* cold leg isolation valve in loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13421000   1      11     2     1    0.04355   0
*
*         loc       flag
13421100  0         2
*
*         dx        int
13421101  0.00352   2
13421102  0.00704   4
13421103  0.01056   6
13421104  0.01407   8
13421105  0.03550   10
*
*        compos.    int
13421201  1         8
13421202  3         10
*
*         source    int
13421301  0.0       10
*
*        temperature flag
13421400  0
*
*         temperature pt
13421401  563.15      11
*
*         vol       inc       type      code      factor      hs
13421501  342010000 00000     1         1         0.880       1
```

```
*
*         vol       inc       type      code      factor      hs
13421601 -900       0         4910        1       0.880       1
*
* source  type      mult      D-lt      D-rt      hs
13421701  0         0.0       0.0       0.0       1
*
13421800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13421801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 3451 *************************************
* cold leg in loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13451000   4      11     2     1    0.03800   0
*
*         loc       flag
13451100  0         2
*
*         dx        int
13451101  0.00080   2
13451102  0.00160   4
13451103  0.00240   6
13451104  0.00320   8
13451105  0.03550   10
*
*        compos.    int
13451201  1         8
13451202  3         10
*
*         source    int
13451301  0.0       10
*
*        temperature flag
13451400  0
*
*         temperature pt
13451401  563.15      11
*
*         vol       inc       type      code      factor      hs
13451501  345010000 10000     1         1         0.782       3
13451502  345040000 00000     1         1         0.741       4
*
*         vol       inc       type      code      factor      hs
13451601 -900       0         4910        1       0.782       3
13451602 -900       0         4910        1       0.741       4
*
* source  type      mult      D-lt      D-rt      hs
13451701  0         0.0       0.0       0.0       4
*
13451800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13451801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  4
*
************************* STRUCTURE 3591 *************************************
* feedwater header for loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13591000   1      11     2     1    0.07456   0
*
*         loc       flag
13591100  1591      2
*
*        temperature flag
13591400  0
*
*         temperature pt
```

```
13591401  563.15      11
*
*         vol       inc       type      code      factor      hs
13591501  359010000 00000     1         1         0.2924      1
*
*         vol       inc       type      code      factor      hs
13591601  372010000 0         1         1         0.2924      1
*
* source  type      mult      D-lt      D-rt      hs
13591701  0         0.0       0.0       0.0       1
*
13591800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13591801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.034 1.1  1.0  1
*
13591900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13591901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.012 1.1  1.0  1
*
************************* STRUCTURE 3601 *************************************
* lower steam generator housing for loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13601000   1       11    2     1    0.2200    0
*
*         loc       flag
13601100  1601
*
*        temperature flag
13601400  0
*
*         temperature pt
13601401  563.15      11
*
*         vol       inc       type      code      factor      hs
13601501  370010000 00000     1         1         0.563       1
*
*         vol       inc       type      code      factor      hs
13601601 -900       0         4913      1         0.563       1
*
* source  type      mult      D-lt      D-rt      hs
13601701  0         0.0       0.0       0.0       1
*
13601800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13601801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   3.9  1.1  1.0  1
*
************************* STRUCTURE 3602 *************************************
* upper steam generator housing for loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13602000   7       11    2     1    0.2200    0
*
*         loc       flag
13602100  1602      2
*
*        temperature flag
13602400  0
*
*         temperature pt
13602401  563.15      11
*
*         vol       inc       type      code      factor      hs
13602501  370020000 10000     1         1         0.476       3
13602502  370050000 00000     1         1         0.374       4
13602503  372010000 00000     1         1         0.630       5
13602504  375010000 10000     1         1         0.470       7
*
```

```
*         vol       inc       type      code      factor      hs
13602601 -900       0         4913      1         0.476       3
13602602 -900       0         4913      1         0.374       4
13602603 -900       0         4913      1         0.630       5
13602604 -900       0         4913      1         0.470       7
*
* source  type      mult      D-lt      D-rt      hs
13602701  0         0.0       0.0       0.0       7
*
13602800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13602801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   3.9  1.1  1.0  7
*
************************* STRUCTURE 3603 *************************************
* upper head for steam generator housing for loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13603000   1       11    1     1    0.0000    0
*
*         loc       flag
13603100  1603      2
*
*        temperature flag
13603400  0
*
*         temperature pt
13603401  563.15      11
*
*         vol       inc       type      code      factor      hs
13603501  375020000 00000     1         1         0.14941     1
*
*         vol       inc       type      code      factor      hs
13603601 -900       0         4913      1         0.14941     1
*
* source  type      mult      D-lt      D-rt      hs
13603701  0         0.0       0.0       0.0       1
*
13603800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13603801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   0.11 1.1  1.0  1
*
************************* STRUCTURE 3701 *************************************
* lower head of the steam generator housing for loop 3
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
13701000   2       11    2     1    0.6691    0
*
*         loc       flag
13701100  1701
*
*        temperature flag
13701400  0
*
*         temperature pt
13701401  563.15      11
*
*         vol       inc       type      code      factor      hs
13701501  310010000 20000000  1         1         0.01701     2
*
*         vol       inc       type      code      factor      hs
13701601  370010000 0         1         1         0.01701     2
*
* source  type      mult      D-lt      D-rt      hs
13701701  0         0.0       0.0       0.0       2
*
13701800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13701801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.200 1.1  1.0  2
```

```
*
13701900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
13701901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.11  1.1  1.0  2
*
************************* STRUCTURE 4011 *************************************
* hot leg nozzle and pipe in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14011000   1       11    2     1    0.03800   0
*
*         loc       flag
14011100  0         2
*
*         dx        int
14011101  0.00085   2
14011102  0.00170   4
14011103  0.00255   6
14011104  0.00340   8
14011105  0.03500   10
*
*        compos.    int
14011201  1         8
14011202  3         10
*
*         source    int
14011301  0.0       10
*
*        temperature flag
14011400  0
*
*         temperature pt
14011401  563.15      11
*
*         vol       inc       type      code      factor      hs
14011501  401010000 0         1         1         0.6683      1
*
*         vol       inc       type      code      factor      hs
14011601 -900       0         4910        1       0.6683      1
*
* source  type      mult      D-lt      D-rt      hs
14011701  0         0.0       0.0       0.0       1
*
14011800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14011801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 4012 *************************************
* hot leg in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14012000   2       11    2     1    0.03800   0
*
*         loc       flag
14012100  0         2
*
*         dx        int
14012101  0.00080   2
14012102  0.00160   4
14012103  0.00240   6
14012104  0.00320   8
14012105  0.03550   10
*
*        compos.    int
14012201  1         8
14012202  3         10
*
*         source    int
14012301  0.0       10
*
*        temperature flag
14012400  0
*
*         temperature pt
14012401  563.15      11
*
*         vol       inc       type      code      factor      hs
14012501  401020000 10000     1         1         0.6683      2
*
*         vol       inc       type      code      factor      hs
14012601 -900       0         4910        1       0.6683      2
*
* source  type      mult      D-lt      D-rt      hs
14012701  0         0.0       0.0       0.0       2
*
14012800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14012801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  2
*
************************* STRUCTURE 4013 *************************************
* surge line nozzle and hot leg in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14013000   1       11    2     1    0.03800   0
*
*         loc       flag
14013100  0         2
*
*         dx        int
14013101  0.00088   2
14013102  0.00176   4
14013103  0.00264   6
14013104  0.00352   8
14013105  0.03469   10
*
*        compos.    int
14013201  1         8
14013202  3         10
*
*         source    int
14013301  0.0       10
*
*        temperature flag
14013400  0
*
*         temperature pt
14013401  563.15      11
*
*         vol       inc       type      code      factor      hs
14013501  401040000 0         1         1         0.420       1
*
*         vol       inc       type      code      factor      hs
14013601 -900       0         4910        1       0.420       1
*
* source  type      mult      D-lt      D-rt      hs
14013701  0         0.0       0.0       0.0       1
*
14013800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14013801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 4014 *************************************
* hot leg in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14014000   3       11    2     1    0.03800   0
```

```
*
*         loc       flag
14014100  0         2
*
*         dx        int
14014101  0.00080   2
14014102  0.00160   4
14014103  0.00240   6
14014104  0.00320   8
14014105  0.03550   10
*
*        compos.    int
14014201  1         8
14014202  3         10
*
*         source    int
14014301  0.0       10
*
*        temperature flag
14014400  0
*
*         temperature pt
14014401  563.15      11
*
*         vol       inc       type      code      factor      hs
14014501  401050000 10000     1         1         0.567       3
*
*         vol       inc       type      code      factor      hs
14014601 -900       0         4910        1       0.567       3
*
* source  type      mult      D-lt      D-rt      hs
14014701  0         0.0       0.0       0.0       3
*
14014800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14014801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   1.5  1.1  1.0  3
*
************************* STRUCTURE 4151 **************************************
* hot collector in loop 4
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14151000   5      11    2     1    0.03649   0
*
*         loc       flag
14151100  1151
*
*        temperature flag
14151400  0
*
*         temperature pt
14151401  563.15      11
*
*         vol       inc       type      code      factor      hs
14151501  415010000 00000     1         1         0.563       1
14151502  415020000 10000     1         1         0.476       4
14151503  415050000 00000     1         1         0.374       5
*
*         vol       inc       type      code      factor      hs
14151601  470010000 00000     1         1         0.563       1
14151602  470020000 10000     1         1         0.476       4
14151603  470050000 00000     1         1         0.374       5
*
* source  type      mult      D-lt      D-rt      hs
14151701  0         0.0       0.0       0.0       5
*
14151800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14151801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
14151900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14151901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
************************* STRUCTURE 4211 **************************************
* steam generator tubes - level 1 loop 4
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14211000   10      11    2     1    0.00650   0
*
*         loc       flag
14211100  0         2
*
*         dx        int
14211101  0.000075  2
14211102  0.000150  4
14211103  0.000300  6
14211104  0.000150  8
14211105  0.000075  10
*
*        compos.    int
14211201  1         10
*
*         source    int
14211301  0.0       10
*
*        temperature flag
14211400  0
*
*         temperature pt
14211401  563.15      11
*
*         vol       inc       type      code      factor      hs
14211501  421010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
14211601  470010000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
14211701  0         0.0       0.0       0.0       10
*
14211800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14211801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
14211802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
14211803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
14211804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
14211805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
14211806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
14211807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
14211808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
14211809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
14211810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
14211900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14211901 0.0  0.21  2.08 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 4221 **************************************
* steam generator tubes - level 2 loop 4
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14221000   10      11    2     1    0.00650   0
*
*         loc       flag
14221100  1211
*
```

```
*        temperature flag
14221400  0
*
*         temperature pt
14221401  563.15      11
*
*         vol       inc       type      code      factor      hs
14221501  422010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
14221601  470020000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
14221701  0         0.0       0.0       0.0       10
*
14221800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14221801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
14221802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
14221803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
14221804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
14221805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
14221806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
14221807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
14221808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
14221809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
14221810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
14221900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14221901 0.0  0.73  1.56 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 4231 *************************************
* steam generator tubes - level 3 loop 4
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14231000   10      11    2     1    0.00650   0
*
*         loc       flag
14231100  1211
*
*        temperature flag
14231400  0
*
*         temperature pt
14231401  563.15      11
*
*         vol       inc       type      code      factor      hs
14231501  423010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
14231601  470030000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
14231701  0         0.0       0.0       0.0       10
*
14231800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14231801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
14231802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
14231803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
14231804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
14231805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
14231806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
14231807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
14231808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
14231809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
14231810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
14231900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14231901 0.0  1.21  1.09 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 4241 *************************************
* steam generator tubes - level 4 loop 4
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14241000   10      11    2     1    0.00650   0
*
*         loc       flag
14241100  1211
*
*        temperature flag
14241400  0
*
*         temperature pt
14241401  563.15      11
*
*         vol       inc       type      code      factor      hs
14241501  424010000 10000     1         1         7.4592      10
*
*         vol       inc       type      code      factor      hs
14241601  470040000 0         134       1         7.4592      10
*
* source  type      mult      D-lt      D-rt      hs
14241701  0         0.0       0.0       0.0       10
*
14241800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14241801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
14241802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
14241803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
14241804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
14241805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
14241806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
14241807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
14241808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
14241809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
14241810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
14241900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14241901 0.0  1.68  0.61 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 4251 *************************************
* steam generator tubes - level 5 loop 4
*==============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14251000   10      11    2     1    0.00650   0
*
*         loc       flag
14251100  1211
*
*        temperature flag
14251400  0
*
*         temperature pt
14251401  563.15      11
*
*         vol       inc       type      code      factor      hs
14251501  425010000 10000     1         1         6.3936      10
*
*         vol       inc       type      code      factor      hs
14251601  470050000 0         134       1         6.3936      10
*
* source  type      mult      D-lt      D-rt      hs
```

```
14251701  0         0.0       0.0       0.0       10
*
14251800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14251801 0.0  0.53 10.12 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  1
14251802 0.0  1.60  9.06 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  2
14251803 0.0  2.66  7.99 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  3
14251804 0.0  3.73  6.93 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  4
14251805 0.0  4.80  5.86 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  5
14251806 0.0  5.86  4.80 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  6
14251807 0.0  6.93  3.73 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  7
14251808 0.0  7.99  2.66 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  8
14251809 0.0  9.06  1.60 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  9
14251810 0.0 10.12  0.53 10.   10.  0.0   0.0   1.0  0.013 1.1  1.2  10
*
14251900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14251901 0.0  2.11  0.19 10.   10.  0.0   0.0   1.0   2.3  1.56 1.0  10
*
************************* STRUCTURE 4291 *************************************
* cold collector in loop 4
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14291000   5      11    2     1    0.03649   0
*
*         loc       flag
14291100  1151
*
*        temperature flag
14291400  0
*
*         temperature pt
14291401  563.15      11
*
*         vol       inc       type      code      factor      hs
14291501  429010000 00000     1         1         0.563       1
14291502  429020000 10000     1         1         0.476       4
14291503  429050000 00000     1         1         0.374       5
*
*         vol       inc       type      code      factor      hs
14291601  470010000 00000     1         1         0.563       1
14291602  470020000 10000     1         1         0.476       4
14291603  470050000 00000     1         1         0.374       5
*
* source  type      mult      D-lt      D-rt      hs
14291701  0         0.0       0.0       0.0       5
*
14291800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14291801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
14291900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14291901 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.37 1.1  1.0  5
*
************************* STRUCTURE 4351 *************************************
* pump suction piping in loop 4
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14351000   13     11    2     1    0.03800   0
*
*         loc       flag
14351100  0         2
*
*         dx        int
14351101  0.00080   2
14351102  0.00160   4
14351103  0.00240   6
14351104  0.00320   8
14351105  0.03550   10
*
*        compos.    int
14351201  1         8
14351202  3         10
*
*         source    int
14351301  0.0       10
*
*        temperature flag
14351400  0
*
*         temperature pt
14351401  563.15      11
*
*         vol       inc       type      code      factor      hs
14351501  435010000 10000     1         1         0.828       5
14351502  435060000 10000     1         1         1.042       7
14351503  435080000 00000     1         1         1.131       8
14351504  435090000 10000     1         1         0.7495      10
14351505  435120000 10000     1         1         0.74775     13
*
*         vol       inc       type      code      factor      hs
14351601 -900       0         4910        1       0.828       5
14351602 -900       0         4910        1       1.042       7
14351603 -900       0         4910        1       1.131       8
14351604 -900       0         4910        1       0.7495      10
14351605 -900       0         4910        1       0.74775     13
*
* source  type      mult      D-lt      D-rt      hs
14351701  0         0.0       0.0       0.0       13
*
14351800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14351801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   6.6  1.1  1.0  8
14351802 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  10
14351803 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  13
*
************************* STRUCTURE 4352 *************************************
* pump suction piping and filter in loop 4
*=============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14352000   1      11    2     1    0.05906   0
*
*         loc       flag
14352100  0         2
*
*         dx        int
14352101  0.00244   2
14352102  0.00489   4
14352103  0.00733   6
14352104  0.00977   8
14352105  0.03550   10
*
*        compos.    int
14352201  1         8
14352202  3         10
*
*         source    int
14352301  0.0       10
*
*        temperature flag
14352400  0
*
*         temperature pt
14352401  563.15      11
*
```

```
*         vol       inc       type      code      factor      hs
14352501  435110000 00000     1         1         0.74775     1
*
*         vol       inc       type      code      factor      hs
14352601 -900       0         4910        1       0.74775     1
*
* source  type      mult      D-lt      D-rt      hs
14352701  0         0.0       0.0       0.0       1
*
14352800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14352801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  1
*
************************* STRUCTURE 4401 *************************************
* main coolant pump in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14401000   1       9     2     1    0.06532   0
*
*         loc       flag
14401100  1401
*
*        temperature flag
14401400  0
*
*         temperature pt
14401401  563.15      9
*
*         vol       inc       type      code      factor      hs
14401501  440010000 00000     1         1         0.746       1
*
*         vol       inc       type      code      factor      hs
14401601 -900       0         4911        1       0.746       1
*
* source  type      mult      D-lt      D-rt      hs
14401701  0         0.0       0.0       0.0       1
*
14401800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14401801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   2.9  1.1  1.0  1
*
************************* STRUCTURE 4421 *************************************
* cold leg isolation valve in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14421000   1      11     2     1    0.04355   0
*
*         loc       flag
14421100  0         2
*
*         dx        int
14421101  0.00352   2
14421102  0.00704   4
14421103  0.01056   6
14421104  0.01407   8
14421105  0.03550   10
*
*        compos.    int
14421201  1         8
14421202  3         10
*
*         source    int
14421301  0.0       10
*
*        temperature flag
14421400  0
*
*         temperature pt
14421401  563.15      11
*
*         vol       inc       type      code      factor      hs
14421501  442010000 00000     1         1         0.880       1
*
*         vol       inc       type      code      factor      hs
14421601 -900       0         4910        1       0.880       1
*
* source  type      mult      D-lt      D-rt      hs
14421701  0         0.0       0.0       0.0       1
*
14421800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14421801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  1
*
************************* STRUCTURE 4451 *************************************
* cold leg in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14451000   4      11     2     1    0.03800   0
*
*         loc       flag
14451100  0         2
*
*         dx        int
14451101  0.00080   2
14451102  0.00160   4
14451103  0.00240   6
14451104  0.00320   8
14451105  0.03550   10
*
*        compos.    int
14451201  1         8
14451202  3         10
*
*         source    int
14451301  0.0       10
*
*        temperature flag
14451400  0
*
*         temperature pt
14451401  563.15      11
*
*         vol       inc       type      code      factor      hs
14451501  445010000 10000     1         1         0.782       3
14451502  445030000 00000     1         1         0.741       4
*
*         vol       inc       type      code      factor      hs
14451601 -900       0         4910        1       0.782       3
14451602 -900       0         4910        1       0.741       4
*
* source  type      mult      D-lt      D-rt      hs
14451701  0         0.0       0.0       0.0       4
*
14451800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14451801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.076 1.1  1.0  4
*
************************* STRUCTURE 4591 *************************************
* feedwater header for loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14591000   1      11     2     1    0.07456   0
*
*         loc       flag
14591100  1591      2
*
```

```
*        temperature flag
14591400  0
*
*         temperature pt
14591401  563.15      11
*
*         vol       inc       type      code      factor      hs
14591501  459010000 00000     1         1         0.2924      1
*
*         vol       inc       type      code      factor      hs
14591601  472010000 0         1         1         0.2924      1
*
* source  type      mult      D-lt      D-rt      hs
14591701  0         0.0       0.0       0.0       1
*
14591800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14591801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.034 1.1  1.0  1
*
14591900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14591901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.012 1.1  1.0  1
*
************************* STRUCTURE 4601 *************************************
* lower steam generator housing for loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14601000   1       11    2     1    0.2200    0
*
*         loc       flag
14601100  1601
*
*        temperature flag
14601400  0
*
*         temperature pt
14601401  563.15      11
*
*         vol       inc       type      code      factor      hs
14601501  470010000 00000     1         1         0.563       1
*
*         vol       inc       type      code      factor      hs
14601601 -900       0         4913      1         0.563       1
*
* source  type      mult      D-lt      D-rt      hs
14601701  0         0.0       0.0       0.0       1
*
14601800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14601801 0.0  10.   10.  10.   10.  0.0   0.0   1.0    3.9  1.1  1.0  1
*
************************* STRUCTURE 4602 *************************************
* upper steam generator housing for loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14602000   7       11    2     1    0.2200    0
*
*         loc       flag
14602100  1602      2
*
*        temperature flag
14602400  0
*
*         temperature pt
14602401  563.15      11
*
*         vol       inc       type      code      factor      hs
14602501  470020000 10000     1         1         0.476       3
14602502  470050000 00000     1         1         0.374       4
14602503  472010000 00000     1         1         0.630       5
14602504  475010000 10000     1         1         0.470       7
*
*         vol       inc       type      code      factor      hs
14602601 -900       0         4913      1         0.476       3
14602602 -900       0         4913      1         0.374       4
14602603 -900       0         4913      1         0.630       5
14602604 -900       0         4913      1         0.470       7
*
* source  type      mult      D-lt      D-rt      hs
14602701  0         0.0       0.0       0.0       7
*
14602800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14602801 0.0  10.   10.  10.   10.  0.0   0.0   1.0    3.9  1.1  1.0  7
*
************************* STRUCTURE 4603 *************************************
* upper head for steam generator housing for loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14603000   1       11    1     1    0.0000    0
*
*         loc       flag
14603100  1603      2
*
*        temperature flag
14603400  0
*
*         temperature pt
14603401  563.15      11
*
*         vol       inc       type      code      factor      hs
14603501  475020000 00000     1         1         0.14941     1
*
*         vol       inc       type      code      factor      hs
14603601 -900       0         4913      1         0.14941     1
*
* source  type      mult      D-lt      D-rt      hs
14603701  0         0.0       0.0       0.0       1
*
14603800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14603801 0.0  10.   10.  10.   10.  0.0   0.0   1.0   0.11 1.1  1.0  1
*
************************* STRUCTURE 4701 *************************************
* lower head of the steam generator housing for loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
14701000   2       11    2     1    0.6691    0
*
*         loc       flag
14701100  1701
*
*        temperature flag
14701400  0
*
*         temperature pt
14701401  563.15      11
*
*         vol       inc       type      code      factor      hs
14701501  410010000 20000000  1         1         0.01701     2
*
*         vol       inc       type      code      factor      hs
14701601  470010000 0         1         1         0.01701     2
*
* source  type      mult      D-lt      D-rt      hs
14701701  0         0.0       0.0       0.0       2
```

```
*
14701800    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14701801 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.200 1.1  1.0  2
*
14701900    1
*        Dhe  LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
14701901 0.0  10.   10.  10.   10.  0.0   0.0   1.0  0.11  1.1  1.0  2
*
************************* STRUCTURE 5010 *************************************
* pressurizer surge line in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15010000   1       11    2     1    0.0215    0
*
*         loc       flag
15010100  0         1
*
*         intervals   radius
15010101  2           0.0222
15010102  2           0.0236
15010103  2           0.0257
15010104  2           0.0285
15010105  2           0.090
*
*        compos.    int
15010201  1         8
15010202  3         10
*
*         source    int
15010301  0.0       10
*
*        temperature flag
15010400  0
*
*         temperature pt
15010401  550.0       11
*
*         vol       inc       type      code      factor      hs
15010501  501010000 00000     1         1         1.126       1
*
*         vol       inc       type      code      factor      hs
15010601 -900       0         4912        1       1.126       1
*
* source  type      mult      D-lt      D-rt      hs
15010701  0         0.0       0.0       0.0       1
*
15010800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15010801 0.043 10.   10.  10.   10.  0.0   0.0   1.0  1.877 1.1  1.0  1
*
************************* STRUCTURE 5050 *************************************
* pressurizer surge line in loop 2
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15050000   7       11    2     1    0.0215    0
*
*         loc
15050100  5010
*
*        temperature flag
15050400  0
*
*         temperature pt
15050401  550.0       11
*
*         vol       inc       type      code      factor      hs
15050501  505010000 00000     1         1         0.876       1
15050502  505020000 00000     1         1         0.662       2
15050503  505030000 10000     1         1         0.940       6
15050504  505070000 00000     1         1         1.031       7
*
*         vol       inc       type      code      factor      hs
15050601 -900       0         4912        1       0.876       1
15050602 -900       0         4912        1       0.662       2
15050603 -900       0         4912        1       0.940       6
15050604 -900       0         4912        1       1.031       7
*
* source  type      mult      D-lt      D-rt      hs
15050701  0         0.0       0.0       0.0       7
*
15050800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15050801 0.043 10.   10.  10.   10.  0.0   0.0   1.0  1.877 1.1  1.0  1
15050802 0.043 10.   10.  10.   10.  0.0   0.0   1.0  0.043 1.1  1.0  2
15050803 0.043 10.   10.  10.   10.  0.0   0.0   1.0  3.760 1.1  1.0  6
15050804 0.043 10.   10.  10.   10.  0.0   0.0   1.0  0.043 1.1  1.0  7
*
************************* STRUCTURE 5110 *************************************
* pressurizer surge line in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15110000   1       11    2     1    0.0215    0
*
*         loc
15110100  5010
*
*        temperature flag
15110400  0
*
*         temperature pt
15110401  550.0       11
*
*         vol       inc       type      code      factor      hs
15110501  511010000 00000     1         1         1.345       1
*
*         vol       inc       type      code      factor      hs
15110601 -900       0         4912        1       1.345       1
*
* source  type      mult      D-lt      D-rt      hs
15110701  0         0.0       0.0       0.0       1
*
15110800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15110801 0.043 10.   10.  10.   10.  0.0   0.0   1.0  3.847 1.1  1.0  1
*
************************* STRUCTURE 5150 *************************************
* pressurizer surge line in loop 4
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15150000   6       11    2     1    0.0215    0
*
*         loc
15150100  5010
*
*        temperature flag
15150400  0
*
*         temperature pt
15150401  550.0       11
*
*         vol       inc       type      code      factor      hs
15150501  515010000 10000     1         1         1.338       2
15150502  515030000 10000     1         1         1.321       4
15150503  515050000 00000     1         1         1.790       5
15150504  515060000 00000     1         1         1.091       6
```

```
*
*         vol       inc       type      code      factor      hs
15150601 -900       0         4912        1       1.338       2
15150602 -900       0         4912        1       1.321       4
15150603 -900       0         4912        1       1.790       5
15150604 -900       0         4912        1       1.091       6
*
* source  type      mult      D-lt      D-rt      hs
15150701  0         0.0       0.0       0.0       6
*
15150800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15150801 0.043 10.   10.  10.   10.  0.0   0.0   1.0  3.847 1.1  1.0  2
15150802 0.043 10.   10.  10.   10.  0.0   0.0   1.0  0.043 1.1  1.0  4
15150803 0.043 10.   10.  10.   10.  0.0   0.0   1.0  1.790 1.1  1.0  5
15150804 0.043 10.   10.  10.   10.  0.0   0.0   1.0  0.043 1.1  1.0  6
*
************************** STRUCTURE 5200 **************************************
* pressurizer surge line, lower common part
*===============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15200000   1       11    2     1    0.0215    0
*
*         loc
15200100  5010
*
*        temperature flag
15200400  0
*
*         temperature pt
15200401  550.0       11
*
*         vol       inc       type      code      factor      hs
15200501  520010000 00000     1         1         1.227       1
*
*         vol       inc       type      code      factor      hs
15200601 -900       0         4912        1       1.227       1
*
* source  type      mult      D-lt      D-rt      hs
15200701  0         0.0       0.0       0.0       1
*
15200800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15200801 0.043 10.   10.  10.   10.  0.0   0.0   1.0  0.867 1.1  1.0  1
*
************************** STRUCTURE 5250 **************************************
* pressurizer surge line, upper common part
*===============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15250000   1       11    2     1    0.014
*
*         loc       flag
15250100  0         1
*
*         intervals   radius
15250101  2           0.0145
15250102  2           0.0155
15250103  2           0.0170
15250104  2           0.0190
15250105  2           0.090
*
*        compos.    int
15250201  1         8
15250202  3         10
*
*         source    int
15250301  0.0       10
*
```

```
*        temperature flag
15250400  0
*
*         temperature pt
15250401  550.0       11
*
*         vol       inc       type      code      factor      hs
15250501  525010000 00000     1         1         0.843       1
*
*         vol       inc       type      code      factor      hs
15250601 -900       0         4912        1       0.843       1
*
* source  type      mult      D-lt      D-rt      hs
15250701  0         0.0       0.0       0.0       1
*
15250800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15250801 0.028 10.   10.  10.   10.  0.0   0.0   1.0  0.843 1.1  1.0  1
*
************************** STRUCTURE 5300 **************************************
* pressurizer cylinder
*===============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15300000   9       11    2     1    0.0815
*
*         loc       flag
15300100  0         1
*
*         intervals   radius
15300101  2           0.0843
15300102  2           0.0899
15300103  2           0.0983
15300104  2           0.1095
15300105  2           0.195
*
*        compos.    int
15300201  1         8
15300202  3         10
*
*         source    int
15300301  0.0       10
*
*        temperature flag
15300400  0
*
*         temperature pt
15300401  550.0       11
*
*         vol       inc       type      code      factor      hs
15300501  530010000 00000     1         1         1.450       1
15300502  530020000 10000     1         1         1.373       8
15300503  535010000 00000     1         1         1.502       9
*
*         vol       inc       type      code      factor      hs
15300601 -900       0         4912        1       1.450       1
15300602 -900       0         4912        1       1.373       8
15300603 -900       0         4912        1       1.502       9
*
* source  type      mult      D-lt      D-rt      hs
15300701  0         0.0       0.0       0.0       9
*
15300800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf  povd ff   hs
15300801 0.163 10.   10.  10.   10.  0.0   0.0   1.0  12.563 1.1  1.0  9
*
************************** STRUCTURE 5301 **************************************
* pressurizer lower plate
*===============================================================================$
```

```
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15301000   1       11    1     1    0.0
*
*         loc       flag
15301100  0         1
*
*         intervals   radius
15301101  2           0.0111
15301102  2           0.0333
15301103  2           0.0666
15301104  2           0.1110
15301105  2           0.1965
*
*        compos.    int
15301201  1         8
15301202  3         10
*
*         source    int
15301301  0.0       10
*
*        temperature flag
15301400  0
*
*         temperature pt
15301401  550.0       11
*
*         vol       inc       type      code      factor      hs
15301501  530010000 00000     1         1         0.02025     1
*
*         vol       inc       type      code      factor      hs
15301601 -900       0         4912        1       0.02025     1
*
* source  type      mult      D-lt      D-rt      hs
15301701  0         0.0       0.0       0.0       1
*
15301800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15301801 0.163 10.   10.  10.   10.  0.0   0.0   1.0   0.01 1.1  1.0  1
*
************************* STRUCTURE 5302 *************************************
* pressurizer heaters
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15302000   1       6     2     1    0.0
*
*         loc       flag
15302100  0         1
*
*         intervals   radius
15302101  1           0.005
15302102  4           0.0065
*
*        compos.    int
15302201  6         1
15302202  1         5
*
*         source    int
15302301  1.0       1
15302302  0.0       5
*
*        temperature flag
15302400  0
*
*         temperature pt
15302401  550.0       6
*
*         vol       inc       type      code      factor      hs
15302501  0         0         0         1         18.0        1
*
*         vol       inc       type      code      factor      hs
15302601  530010000 00000     1           1       18.0        1
*
* source  type      mult      D-lt      D-rt      hs
15302701  530       1.0       0.0       0.0       1
*
15302900    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15302901 0.157 10.   10.  10.   10.  0.0   0.0   1.0   1.45 1.1  1.0  1
*
************************* STRUCTURE 5351 *************************************
* pressurizer upper plate
*============================================================================$
*ht str ht.strs  m.pts  geom  init  l.coord  refl  b.vol   ax.incr.
15351000   1       11    1     1    0.0
*
*         loc       flag
15351100  5301
*
*        temperature flag
15351400  0
*
*         temperature pt
15351401  550.0       11
*
*         vol       inc       type      code      factor      hs
15351501  535010000 00000     130       1         0.02055     1
*
*         vol       inc       type      code      factor      hs
15351601 -900       0         4912        1       0.02055     1
*
* source  type      mult      D-lt      D-rt      hs
15351701  0         0.0       0.0       0.0       1
*
15351800    1
*        Dhe   LHEf  LHEr LGSf  LGSr Kfwd  Krev  Fboil nclf povd ff   hs
15351801 0.163 10.   10.  10.   10.  0.0   0.0   1.0   0.01 1.1  1.0  1
*
*************************** COMPOSITION 1 ************************************
*============================================================================$
20100100 tbl/fctn        1        1          * stainless steel
*-----------------------------------------------------------------------------
20100101          273.     14.9
20100102          373.     16.1
20100103          473.     17.6
20100104          573.     19.2
20100105          673.     20.8
20100106          873.     23.9
20100107          1073.    27.6
*
20100151          273.     3.871e6
20100152          373.     4.048e6
20100153          473.     4.192e6
20100154          573.     4.302e6
20100155          673.     4.443e6
20100156          873.     4.613e6
20100157          1073.    4.748e6
*************************** COMPOSITION 2 ************************************
*============================================================================$
20100200 tbl/fctn        1        1          * copper
*-----------------------------------------------------------------------------
20100201          273.     393.
20100202          373.     385.
20100203          473.     378.
20100204          573.     371.
20100205          673.     365.
20100206          873.     354.
```

```
20100207          1073.    341.
*
20100251          273.     3.465e6
20100252          373.     3.516e6
20100253          473.     3.576e6
20100254          573.     3.635e6
20100255          673.     3.693e6
20100256          873.     3.797e6
20100257          1073.    3.455e6
**************************** COMPOSITION 3 ***************************************
*===============================================================================$
20100300 tbl/fctn         1         1          * glass wool
*-------------------------------------------------------------------------------
20100301                   0.42
*
20100351                   3.42e4
**************************** COMPOSITION 4 ***************************************
*===============================================================================$
20100400 tbl/fctn         1         1          * nichrome
*-------------------------------------------------------------------------------
20100401          373.     15.0
20100402         1273.     27.0
*
20100451          373.     3.864e6
20100452         1273.     3.864e6
**************************** COMPOSITION 5 ***************************************
*===============================================================================$
20100500 tbl/fctn         1         1          * magnesium oxide
*-------------------------------------------------------------------------------
20100501          373.     5.0
20100502         1273.     2.5
*
20100551          373.     3.026e6
20100552         1273.     3.664e6
**************************** COMPOSITION 6 ***************************************
*===============================================================================$
20100600 tbl/fctn         1         1          * periclase
*-------------------------------------------------------------------------------
20100601          373.     3.73
20100602          473.     3.35
20100603          673.     2.60
20100604          773.     2.33
20100605          873.     2.15
20100606          923.     2.12
20100607         1073.     2.30
20100608         1173.     2.50
20100609         1273.     2.80
*
20100651          373.     3.026e6
20100652         1273.     3.664e6
**************************** COMPOSITION 7 ***************************************
*===============================================================================$
20100700 tbl/fctn         1         1          * secondary insulation
*-------------------------------------------------------------------------------
20100701                   1.0
*
20100751                   3.42e4
*===============================================================================*
* bypass power table
*20205000     power    0                         * sscalc
*20205001     0.0      17.4e3                    * sscalc
20205000     power   50                         * trancalc
20205001    -1.0       0.0                      * trancalc
20205002     0.0      17.4e3                    * trancalc
20205003     5.0      17.4e3                    * trancalc
20205004     6.0      16.86e3                   * trancalc
20205005    24.0      16.86e3                   * trancalc
20205006    30.0      14.0e3                    * trancalc
20205007    39.0      12.0e3                    * trancalc
20205008    61.0      11.2e3                    * trancalc
20205009    90.0      11.85e3                   * trancalc
20205010   110.0      11.6e3                    * trancalc
20205011   149.0      11.65e3                   * trancalc
20205012   200.0      11.2e3                    * trancalc
20205013   278.0      11.13e3                   * trancalc
20205014   350.0      11.2e3                    * trancalc
20205015   446.0      11.4e3                    * trancalc
20205016   545.0      11.9e3                    * trancalc
20205017   559.0      11.6e3                    * trancalc
20205018  1200.0      11.6e3                    * trancalc
*===============================================================================*
* core simulator power table
20210000     power    0  1.0  1.e6
20210001     0.0      1.520
20210002     5.0      1.520                     * trancalc
20210003     6.0      1.410                     * trancalc
20210004    13.0      1.410                     * trancalc
20210005    15.0      1.388                     * trancalc
20210006    24.0      1.388                     * trancalc
20210007    28.0      1.200                     * trancalc
20210008    36.0      1.040                     * trancalc
20210009    44.0      1.010                     * trancalc
20210010    50.0      1.001                     * trancalc
20210011    61.0      0.971                     * trancalc
20210012    90.0      1.015                     * trancalc
20210013   106.0      1.005                     * trancalc
20210014   147.0      1.012                     * trancalc
20210015   198.0      0.985                     * trancalc
20210016   327.0      0.985                     * trancalc
20210017   350.0      0.990                     * trancalc
20210018  1200.0      0.990                     * trancalc
*===============================================================================*
* pressurizer heater power table
20253000     power    1533
20253001     0.0      0.0
20253002     1.0     70.0e3
*===============================================================================*
* ambient air -- 33 deg C
*===============================================================================*
20290000     temp
20290001     0.0     306.15
*===============================================================================*
* heat transfer coefficient to air
*===============================================================================*
20291000     htc-temp  0  1.0  0.0  1.2
20291001     348.15  2.579
20291002     398.15  3.250
20291003     440.98  3.660
20291004     498.15  4.095
*===============================================================================*
* exterior heat transfer coefficient for main coolant pumps
*===============================================================================*
20291100     htc-temp
20291101     306.15  1926.
*===============================================================================*
* heat transfer coefficient to air for pressurizer and surge line
*===============================================================================*
20291200     htc-temp
20291201     381.2   2.59
20291202     404.0   2.93
20291203     416.7   3.12
20291204     442.6   3.53
20291205     449.8   3.99
*===============================================================================*
* heat transfer coefficient to air for secondary coolant system
*===============================================================================*
```

```
20291300     htc-temp
20291301     381.2   10.0
**********************************************************************$
*                       CONTROL VARIABLES                             $
**********************************************************************$
20500000  9999
*
*=====================================================================$
*  core collapsed liquid level
*=====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20500400     corelvl    sum       1.0      3.53   1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20500401   0.0 0.255  voidf  040010000     0.255    voidf  040020000
20500402       0.255  voidf  040030000     0.255    voidf  040040000
20500403       0.255  voidf  040050000     0.255    voidf  040060000
20500404       0.255  voidf  040070000     0.255    voidf  040080000
20500405       0.255  voidf  040090000     0.255    voidf  040100000
20500406       0.255  voidf  040110000     0.255    voidf  040120000
20500407       0.255  voidf  040130000     0.215    voidf  040140000
*
*=====================================================================$
*  bypass heater maximum wall temperature
*=====================================================================$
*
*ctlvar      name       type     factor    init    f
20500500   byhtrtmx     stdfnctn  1.0      506.002 1
*
*ctlvar   function  var name param      var name param
20500501  max       httemp   050200201  httemp   050200301
20500502            httemp   050200401  httemp   050200501
20500503            httemp   050200601  httemp   050200701
20500504            httemp   050200801
*
*=====================================================================$
* main circulation pump speed controllers
*=====================================================================$
*
*ctlvar      name       type     factor
20501400   "MCP1 spd"   constant 39.0738                  * trancalc
*
*ctlvar      name       type     factor
20502400   "MCP2 spd"   constant 39.0749                  * trancalc
*
*ctlvar      name       type     factor
20503400   "MCP3 spd"   constant 39.0739                  * trancalc
*
*ctlvar      name       type     factor
20504400   "MCP4 spd"   constant 40.4556                  * trancalc
*
*=====================================================================$
*  steam generator power (kw)
*=====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20501610   sg1tb1-q     sum     -0.001      67.4524 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20501611  0.0  1.0   q        121010000   1.0   q        121020000
20501612       1.0   q        121030000   1.0   q        121040000
20501613       1.0   q        121050000   1.0   q        121060000
20501614       1.0   q        121070000   1.0   q        121080000
20501615       1.0   q        121090000   1.0   q        121100000
*
*ctlvar      name       type     factor    init   f c     min    max
20501620   sg1tb2-q     sum     -0.001      68.9221 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20501621  0.0  1.0   q        122010000   1.0   q        122020000
20501622       1.0   q        122030000   1.0   q        122040000
20501623       1.0   q        122050000   1.0   q        122060000
20501624       1.0   q        122070000   1.0   q        122080000
20501625       1.0   q        122090000   1.0   q        122100000
*
*ctlvar      name       type     factor    init   f c     min    max
20501630   sg1tb3-q     sum     -0.001      70.101  1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20501631  0.0  1.0   q        123010000   1.0   q        123020000
20501632       1.0   q        123030000   1.0   q        123040000
20501633       1.0   q        123050000   1.0   q        123060000
20501634       1.0   q        123070000   1.0   q        123080000
20501635       1.0   q        123090000   1.0   q        123100000
*
*ctlvar      name       type     factor    init   f c     min    max
20501640   sg1tb4-q     sum     -0.001      70.941  1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20501641  0.0  1.0   q        124010000   1.0   q        124020000
20501642       1.0   q        124030000   1.0   q        124040000
20501643       1.0   q        124050000   1.0   q        124060000
20501644       1.0   q        124070000   1.0   q        124080000
20501645       1.0   q        124090000   1.0   q        124100000
*
*ctlvar      name       type     factor    init   f c     min    max
20501650   sg1tb5-q     sum     -0.001      60.8294 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20501651  0.0  1.0   q        125010000   1.0   q        125020000
20501652       1.0   q        125030000   1.0   q        125040000
20501653       1.0   q        125050000   1.0   q        125060000
20501654       1.0   q        125070000   1.0   q        125080000
20501655       1.0   q        125090000   1.0   q        125100000
*
*ctlvar      name       type     factor    init   f c     min    max
20501660   sg1hc-q      sum     -0.001      14.06567 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20501661  0.0  1.0   q        115010000   1.0   q        115020000
20501662       1.0   q        115030000   1.0   q        115040000
20501663       1.0   q        115050000
*
*ctlvar      name       type     factor    init   f c     min    max
20501670   sg1cc-q      sum     -0.001      .284509  1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20501671  0.0  1.0   q        129010000   1.0   q        129020000
20501672       1.0   q        129030000   1.0   q        129040000
20501673       1.0   q        129050000   1.0   q        129060000
*
*ctlvar      name       type     factor    init   f c     min    max
20501700   sg1-q        sum      1.0       347.601  1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20501701  0.0  1.0   cntrlvar 161         1.0   cntrlvar 162
20501702       1.0   cntrlvar 163         1.0   cntrlvar 164
20501703       1.0   cntrlvar 165         1.0   cntrlvar 166
20501704       1.0   cntrlvar 167        -0.001 q        110010000
20501705      -0.001 q        130010000  -0.001 q        159010000
*
*ctlvar      name       type     factor    init   f c     min    max
20502610   sg2tb1-q     sum     -0.001      67.4517 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20502611  0.0  1.0   q        221010000   1.0   q        221020000
```

```
20502612       1.0   q        221030000   1.0   q        221040000
20502613       1.0   q        221050000   1.0   q        221060000
20502614       1.0   q        221070000   1.0   q        221080000
20502615       1.0   q        221090000   1.0   q        221100000
*
*ctlvar      name       type     factor    init   f c     min    max
20502620   sg2tb2-q     sum     -0.001      68.9214 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20502621  0.0  1.0   q        222010000   1.0   q        222020000
20502622       1.0   q        222030000   1.0   q        222040000
20502623       1.0   q        222050000   1.0   q        222060000
20502624       1.0   q        222070000   1.0   q        222080000
20502625       1.0   q        222090000   1.0   q        222100000
*
*ctlvar      name       type     factor    init   f c     min    max
20502630   sg2tb3-q     sum     -0.001      70.1002 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20502631  0.0  1.0   q        223010000   1.0   q        223020000
20502632       1.0   q        223030000   1.0   q        223040000
20502633       1.0   q        223050000   1.0   q        223060000
20502634       1.0   q        223070000   1.0   q        223080000
20502635       1.0   q        223090000   1.0   q        223100000
*
*ctlvar      name       type     factor    init   f c     min    max
20502640   sg2tb4-q     sum     -0.001      70.9403 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20502641  0.0  1.0   q        224010000   1.0   q        224020000
20502642       1.0   q        224030000   1.0   q        224040000
20502643       1.0   q        224050000   1.0   q        224060000
20502644       1.0   q        224070000   1.0   q        224080000
20502645       1.0   q        224090000   1.0   q        224100000
*
*ctlvar      name       type     factor    init   f c     min    max
20502650   sg2tb5-q     sum     -0.001      60.8296 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20502651  0.0  1.0   q        225010000   1.0   q        225020000
20502652       1.0   q        225030000   1.0   q        225040000
20502653       1.0   q        225050000   1.0   q        225060000
20502654       1.0   q        225070000   1.0   q        225080000
20502655       1.0   q        225090000   1.0   q        225100000
*
*ctlvar      name       type     factor    init   f c     min    max
20502660   sg2hc-q      sum     -0.001      14.0655 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20502661  0.0  1.0   q        215010000   1.0   q        215020000
20502662       1.0   q        215030000   1.0   q        215040000
20502663       1.0   q        215050000
*
*ctlvar      name       type     factor    init   f c     min    max
20502670   sg2cc-q      sum     -0.001      .284579  1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20502671  0.0  1.0   q        229010000   1.0   q        229020000
20502672       1.0   q        229030000   1.0   q        229040000
20502673       1.0   q        229050000   1.0   q        229060000
*
*ctlvar      name       type     factor    init   f c     min    max
20502700   sg2-q        sum      1.0        347.59  1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20502701  0.0  1.0   cntrlvar 261         1.0   cntrlvar 262
20502702       1.0   cntrlvar 263         1.0   cntrlvar 264
20502703       1.0   cntrlvar 265         1.0   cntrlvar 266
20502704       1.0   cntrlvar 267        -0.001 q        210010000
20502705      -0.001 q        230010000  -0.001 q        259010000
*
*ctlvar      name       type     factor    init   f c     min    max
20503610   sg3tb1-q     sum     -0.001      67.4817 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20503611  0.0  1.0   q        321010000   1.0   q        321020000
20503612       1.0   q        321030000   1.0   q        321040000
20503613       1.0   q        321050000   1.0   q        321060000
20503614       1.0   q        321070000   1.0   q        321080000
20503615       1.0   q        321090000   1.0   q        321100000
*
*ctlvar      name       type     factor    init   f c     min    max
20503620   sg3tb2-q     sum     -0.001      68.9532 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20503621  0.0  1.0   q        322010000   1.0   q        322020000
20503622       1.0   q        322030000   1.0   q        322040000
20503623       1.0   q        322050000   1.0   q        322060000
20503624       1.0   q        322070000   1.0   q        322080000
20503625       1.0   q        322090000   1.0   q        322100000
*
*ctlvar      name       type     factor    init   f c     min    max
20503630   sg3tb3-q     sum     -0.001      70.1335 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20503631  0.0  1.0   q        323010000   1.0   q        323020000
20503632       1.0   q        323030000   1.0   q        323040000
20503633       1.0   q        323050000   1.0   q        323060000
20503634       1.0   q        323070000   1.0   q        323080000
20503635       1.0   q        323090000   1.0   q        323100000
*
*ctlvar      name       type     factor    init   f c     min    max
20503640   sg3tb4-q     sum     -0.001      70.9744 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20503641  0.0  1.0   q        324010000   1.0   q        324020000
20503642       1.0   q        324030000   1.0   q        324040000
20503643       1.0   q        324050000   1.0   q        324060000
20503644       1.0   q        324070000   1.0   q        324080000
20503645       1.0   q        324090000   1.0   q        324100000
*
*ctlvar      name       type     factor    init   f c     min    max
20503650   sg3tb5-q     sum     -0.001      60.8548 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20503651  0.0  1.0   q        325010000   1.0   q        325020000
20503652       1.0   q        325030000   1.0   q        325040000
20503653       1.0   q        325050000   1.0   q        325060000
20503654       1.0   q        325070000   1.0   q        325080000
20503655       1.0   q        325090000   1.0   q        325100000
*
*ctlvar      name       type     factor    init   f c     min    max
20503660   sg3hc-q      sum     -0.001      14.07266 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20503661  0.0  1.0   q        315010000   1.0   q        315020000
20503662       1.0   q        315030000   1.0   q        315040000
20503663       1.0   q        315050000
*
*ctlvar      name       type     factor    init   f c     min    max
20503670   sg3cc-q      sum     -0.001      .284378 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20503671  0.0  1.0   q        329010000   1.0   q        329020000
20503672       1.0   q        329030000   1.0   q        329040000
20503673       1.0   q        329050000   1.0   q        329060000
```

```
*
*ctlvar      name       type     factor    init   f c     min    max
20503700   sg3-q        sum      1.0        339.7404 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20503701  0.0  1.0   cntrlvar 361         1.0   cntrlvar 362
20503702       1.0   cntrlvar 363         1.0   cntrlvar 364
20503703       1.0   cntrlvar 365         1.0   cntrlvar 366
20503704       1.0   cntrlvar 367        -0.001 q        310010000
20503705      -0.001 q        330010000  -0.001 q        359010000
*
*ctlvar      name       type     factor    init   f c     min    max
20504610   sg4tb1-q     sum     -0.001      70.7022 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20504611  0.0  1.0   q        421010000   1.0   q        421020000
20504612       1.0   q        421030000   1.0   q        421040000
20504613       1.0   q        421050000   1.0   q        421060000
20504614       1.0   q        421070000   1.0   q        421080000
20504615       1.0   q        421090000   1.0   q        421100000
*
*ctlvar      name       type     factor    init   f c     min    max
20504620   sg4tb2-q     sum     -0.001      72.0521 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20504621  0.0  1.0   q        422010000   1.0   q        422020000
20504622       1.0   q        422030000   1.0   q        422040000
20504623       1.0   q        422050000   1.0   q        422060000
20504624       1.0   q        422070000   1.0   q        422080000
20504625       1.0   q        422090000   1.0   q        422100000
*
*ctlvar      name       type     factor    init   f c     min    max
20504630   sg4tb3-q     sum     -0.001      73.128  1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20504631  0.0  1.0   q        423010000   1.0   q        423020000
20504632       1.0   q        423030000   1.0   q        423040000
20504633       1.0   q        423050000   1.0   q        423060000
20504634       1.0   q        423070000   1.0   q        423080000
20504635       1.0   q        423090000   1.0   q        423100000
*
*ctlvar      name       type     factor    init   f c     min    max
20504640   sg4tb4-q     sum     -0.001      73.874  1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20504641  0.0  1.0   q        424010000   1.0   q        424020000
20504642       1.0   q        424030000   1.0   q        424040000
20504643       1.0   q        424050000   1.0   q        424060000
20504644       1.0   q        424070000   1.0   q        424080000
20504645       1.0   q        424090000   1.0   q        424100000
*
*ctlvar      name       type     factor    init   f c     min    max
20504650   sg4tb5-q     sum     -0.001      63.2822 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20504651  0.0  1.0   q        425010000   1.0   q        425020000
20504652       1.0   q        425030000   1.0   q        425040000
20504653       1.0   q        425050000   1.0   q        425060000
20504654       1.0   q        425070000   1.0   q        425080000
20504655       1.0   q        425090000   1.0   q        425100000
*
*ctlvar      name       type     factor    init   f c     min    max
20504660   sg4hc-q      sum     -0.001      14.18828 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20504661  0.0  1.0   q        415010000   1.0   q        415020000
20504662       1.0   q        415030000   1.0   q        415040000
20504663       1.0   q        415050000
```

```
*
*ctlvar      name       type     factor    init   f c     min    max
20504670   sg4cc-q      sum     -0.001      .30535   1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20504671  0.0  1.0   q        429010000   1.0   q        429020000
20504672       1.0   q        429030000   1.0   q        429040000
20504673       1.0   q        429050000   1.0   q        429060000
*
*ctlvar      name       type     factor    init   f c     min    max
20504700   sg4-q        sum      1.0        362.1655 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20504701  0.0  1.0   cntrlvar 461         1.0   cntrlvar 462
20504702       1.0   cntrlvar 463         1.0   cntrlvar 464
20504703       1.0   cntrlvar 465         1.0   cntrlvar 466
20504704       1.0   cntrlvar 467        -0.001 q        410010000
20504705      -0.001 q        430010000  -0.001 q        459010000
*
*==================================================================$
*  pressurizer collapsed liquid levels
*==================================================================$
* total pressurizer
*
*ctlvar      name       type     factor    init   f c     min    max
20505300   pzrlevel     sum      1.0        8.87532 1 0
*
*ctlvar   a0   coeff var name param       coeff var name param
20505301  0.0  1.450 voidf    530010000   1.373 voidf    530020000
20505302       1.373 voidf    530030000   1.373 voidf    530040000
20505303       1.373 voidf    530050000   1.373 voidf    530060000
20505304       1.373 voidf    530070000   1.373 voidf    530080000
20505305       1.502 voidf    535010000
*
* upper portion - corresponds to measurement YP01L02
*
*ctlvar      name       type     factor    init   f c     min    max
20505320   pzrlvl02     sum      1.0        6.99  1 1     0.0
*
*ctlvar   a0     coeff var name param       coeff var name param
20505321 -0.435  1.373 voidf    530020000   1.373 voidf    530030000
20505322         1.373 voidf    530040000   1.373 voidf    530050000
20505323         1.373 voidf    530060000   1.373 voidf    530070000
20505324         1.373 voidf    530080000   0.799 voidf    535010000
*
*==================================================================$
*  accumulator 4 level
*==================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20506000   acc4lvl      sum      33.48962   4.07987 1 0
*
* The lower tap on the accumulator level measurement is 0.75 m above
*  the bottom of the tank.  This is reflected in a0.
*ctlvar           a0       coeff        variable name  parameter no.
20506001       -0.022395   1.0          acvliq         600
*
*==================================================================$
*  accumulator 2 level
*==================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20506050   acc2lvl      sum      33.48962   4.1073  1 0
*
*ctlvar           a0       coeff        variable name  parameter no.
20506051       -0.022395   1.0          acvliq         605
*
*==================================================================$
```

```
*  accumulator 3 level
*====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20506600   acc3lvl      sum      33.48962   4.11001 1 0
*
*ctlvar           a0       coeff        variable name  parameter no.
20506601        -0.022395   1.0          acvliq         660
*
*====================================================================$
*  accumulator 1 level
*====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20506650   acc1lvl      sum      33.48962   4.08992 1 0
*
*ctlvar           a0       coeff        variable name  parameter no.
20506651        -0.022395   1.0          acvliq         665
*
*====================================================================$
*  integrated break flow rate
*====================================================================$
*
20508010   ibrkflo    integral    1.0      0.        1
20508011   mflowj   801000000
*
*====================================================================$
*  vessel differential pressures (kPa)
*====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20510010    yc1dp01     sum      0.001      -8.5575  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510011   0.0  1.0   p      015010000     -2.2800  rho    015010000
20510012       -1.0   p      012010000      0.0490  rho    012010000
*
*ctlvar      name       type     factor    init   f c     min    max
20510020    yc1dp02     sum      0.001      -4.07784  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510021   0.0  1.0   p      012010000     -0.0490  rho    012010000
20510022       -1.0   p      015050000     -1.7162  rho    015050000
*
*ctlvar      name       type     factor    init   f c     min    max
20510030    yc1dp03     sum      0.001      -25.6075  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510031   0.0  1.0   p      015050000      1.7162  rho    015050000
20510032       -1.0   p      015130000      0.9807  rho    015130000
*
*ctlvar      name       type     factor    init   f c     min    max
20510040    yc1dp04     sum      0.001      -11.39573 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510041   0.0  1.0   p      015130000     -0.9807  rho    015130000
20510042       -1.0   p      020010000     -3.2362  rho    020010000
*
*ctlvar      name       type     factor    init   f c     min    max
20510050    yc1dp05     sum      0.001      -8.38906 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510051   0.0  1.0   p      020010000      3.2362  rho    020010000
20510052       -1.0   p      022010000     -1.2945  rho    022010000
*
*ctlvar      name       type     factor    init   f c     min    max
20510060    yc1dp06     sum      0.001      8.52291 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510061   0.0  1.0   p      020010000      3.2362  rho    020010000
20510062       -1.0   p      030020000      2.1329  rho    030020000
*
*ctlvar      name       type     factor    init   f c     min    max
20510070    yc1dp07     sum      0.001      -7.45213 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510071   0.0  1.0   p      040040000      0.0735  rho    040040000
20510072       -1.0   p      030020000      2.1329  rho    030020000
*
*ctlvar      name       type     factor    init   f c     min    max
20510080    yc1dp08     sum      0.001      -8.07858 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510081   0.0  1.0   p      040080000      0.2697  rho    040080000
20510082       -1.0   p      040040000     -0.0735  rho    040040000
*
*ctlvar      name       type     factor    init   f c     min    max
20510090    yc1dp09     sum      0.001      -4.70918  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510091   0.0  1.0   p      040100000     -0.6619  rho    040100000
20510092       -1.0   p      040080000     -0.2697  rho    040080000
*
*ctlvar      name       type     factor    init   f c     min    max
20510100    yc1dp10     sum      0.001      -7.96534 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510101   0.0  1.0   p      040140000     -0.9071  rho    040140000
20510102       -1.0   p      040100000      0.6619  rho    040100000
*
*ctlvar      name       type     factor    init   f c     min    max
20510110    yc1dp11     sum      0.001      -6.00502 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510111   0.0  1.0   p      062010000     -2.3291  rho    062010000
20510112       -1.0   p      040140000      0.9071  rho    040140000
*
*ctlvar      name       type     factor    init   f c     min    max
20510120    yc1dp12     sum      0.001      -5.79419 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510121   0.0  1.0   p      062030000      2.0839  rho    062030000
20510122       -1.0   p      062010000      2.3291  rho    062010000
*
*ctlvar      name       type     factor    init   f c     min    max
20510130    yc1dp13     sum      0.001      -11.09935 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510131   0.0  1.0   p      066010000      0.0490  rho    066010000
20510132       -1.0   p      062030000     -2.0839  rho    062030000
*
*ctlvar      name       type     factor    init   f c     min    max
20510140    yc1dp14     sum      0.001      -10.4164  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510141   0.0  1.0   p      062090000     -2.5301  rho    062090000
20510142       -1.0   p      066010000     -0.0490  rho    066010000
*
*ctlvar      name       type     factor    init   f c     min    max
20510150    yc1dp15     sum      0.001      -17.54303 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510151   0.0  1.0   p      070020000     -4.8813  rho    070020000
20510152       -1.0   p      062090000      2.5301  rho    062090000
*
*ctlvar      name       type     factor    init   f c     min    max
```

```
20510160    yc1dp16     sum      0.001      18.54562 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510161   0.0  1.0   p      012010000     -0.0490  rho    012010000
20510162       -1.0   p      066010000     -0.0490  rho    066010000
*
*ctlvar      name       type     factor    init   f c     min    max
20510170    yc1dp17     sum      0.001      -35.1788 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510171   0.0  1.0   p      050100000      1.4514  rho    050100000
20510172       -1.0   p      050020000     -0.5148  rho    050020000
*
*=====================================================================$
*  dc differential pressure (kPa)
*=====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20510200    yc1dpdc     sum       1.0       -41.0811 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510201   0.0  1.0   cntrlvar  1002        1.0     cntrlvar  1003
20510202        1.0   cntrlvar  1004
*=====================================================================$
*  core differential pressure (kPa)
*=====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20510300    yc1dpco     sum       1.0       -28.2052 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510301   0.0  1.0   cntrlvar  1007        1.0     cntrlvar  1008
20510302        1.0   cntrlvar  1009        1.0     cntrlvar  1010
*=====================================================================$
*  upper plenum differential pressure (kPa)
*=====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20510400    yc1dpup     sum       1.0       -22.89856 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20510401   0.0  1.0   cntrlvar  1011        1.0     cntrlvar  1012
20510402        1.0   cntrlvar  1013
*=====================================================================$
*  loop 1differential pressures (kPa)
*=====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20511010    ya1dp01     sum      0.001      1.586833 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511011   0.0  1.0   p      066010000      0.0490  rho    066010000
20511012       -1.0   p      101040000
*
*ctlvar      name       type     factor    init   f c     min    max
20511020    ya1dp02     sum      0.001      8.95972 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511021   0.0  1.0   p      101040000
20511022       -1.0   p      101070000     0.6718   rho    101070000
*
*ctlvar      name       type     factor    init   f c     min    max
20511030    ya1dp03     sum      0.001      3.627034 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511031   0.0  1.0   p      101070000    -0.6718   rho    101070000
20511032       -1.0   p      135010000     1.9515   rho    135010000
*
*ctlvar      name       type     factor    init   f c     min    max
20511040    ya1dp04     sum      0.001      -22.0563  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511041   0.0  1.0   p      135010000    -1.9515   rho    135010000
20511042       -1.0   p      135040000    -3.1577   rho    135040000
*
*ctlvar      name       type     factor    init   f c     min    max
20511050    ya1dp05     sum      0.001      -24.3481  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511051   0.0  1.0   p      135040000     3.1577   rho    135040000
20511052       -1.0   p      135090000
*
*ctlvar      name       type     factor    init   f c     min    max
20511060    ya1dp06     sum      0.001      -14.7393  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511061   0.0  1.0   p      145030000
20511062       -1.0   p      135090000
*
*ctlvar      name       type     factor    init   f c     min    max
20511080    ya1dp08     sum      0.001      4.09756 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511081   0.0  1.0   p      135090000
20511082       -1.0   p      135110000     2.3082   rho    135110000
*
*ctlvar      name       type     factor    init   f c     min    max
20511090    ya1dp09     sum      0.001      -10.54117 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511091   0.0  1.0   p      142010000
20511092       -1.0   p      135110000     2.3082   rho    135110000
*
*ctlvar      name       type     factor    init   f c     min    max
20511100    ya1dp10     sum      0.001      .1005723 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511101   0.0  1.0   p      142010000
20511102       -1.0   p      145030000
*
*ctlvar      name       type     factor    init   f c     min    max
20511110    ya1dp11     sum      0.001      -1.054094 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511111   0.0  1.0   p      145030000
20511112       -1.0   p      012010000     0.0490   rho    012010000
*
*ctlvar      name       type     factor    init   f c     min    max
20511130    ya1dp13     sum      0.001      -19.83667 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511131   0.0  1.0   p      115050000    -3.3784   rho    115050000
20511132       -1.0   p      101070000     0.6718   rho    101070000
*
*ctlvar      name       type     factor    init   f c     min    max
20511140    ya1dp14     sum      0.001      -20.93663 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511141   0.0  1.0   p      129060000    -1.0836   rho    129060000
20511142       -1.0   p      135010000     1.9515   rho    135010000
*=====================================================================$
*  loop 1 hot leg differential pressure (kPa)
*=====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20511200    ya1hleg     sum       1.0       10.54655 1 0
*
```

```
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511201   0.0  1.0   cntrlvar  1101       1.0     cntrlvar  1102
*====================================================================$
*  loop 1 loop seal down differential pressure (kPa)
*====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20511300    ya1sldn     sum       1.0       -46.4044 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511301   0.0  1.0   cntrlvar  1104       1.0     cntrlvar  1105
*====================================================================$
*  loop 1 loop seal up differential pressure (kPa)
*====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20511400    ya1slup     sum       1.0       14.63873 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511401   0.0  1.0   cntrlvar  1108      -1.0     cntrlvar  1109
*====================================================================$
*  loop 1 cold leg  differential pressure (kPa)
*====================================================================$
*
*ctlvar      name       type     factor    init   f c     min    max
20511500    ya1cleg     sum       1.0       -.953522 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20511501   0.0  1.0   cntrlvar  1110       1.0     cntrlvar  1111
*
*====================================================================$
*  dc heat loss  (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520150     dchloss    sum      -0.001     4.06223  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20520151   0.0  1.0   q      015010000      1.0     q      015020000
20520152        1.0   q      010010000      1.0     q      012010000
20520153        1.0   q      015050000      1.0     q      015060000
20520154        1.0   q      015070000      1.0     q      015080000
20520155        1.0   q      015090000      1.0     q      015100000
20520156        1.0   q      015110000      1.0     q      015120000
20520157        1.0   q      015130000      1.0     q      015140000
20520158        1.0   q      015150000      1.0     q      018010000
+               1.0   q      020010000      1.0     q      022010000
*====================================================================$
*  dc to upper plenum bypass heat loss  (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520260     dcuphls    sum      -0.001     .586694 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20520261   0.0  1.0   q      026010000      1.0     q      026020000
20520262        1.0   q      028010000
*====================================================================$
*  below heated core heat loss  (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520300     cs1hlss    sum      -0.001    1.410086 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20520301   0.0  1.0   q      024010000      1.0     q      030010000
20520302        1.0   q      030020000
*====================================================================$
*  core simulator power  (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520390     htrpow     function  0.001     1520. 1 0
*
*ctlvar    parameter         table
20520391   time    0         100
*====================================================================$
*  core heat loss  (kW); accounts for core power
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520400     corhlss    sum      -0.001     4.44427  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20520401   0.0 1.0    q      040010000     1.0      q      040020000
20520402       1.0    q      040030000     1.0      q      040040000
20520403       1.0    q      040050000     1.0      q      040060000
20520404       1.0    q      040070000     1.0      q      040080000
20520405       1.0    q      040090000     1.0      q      040100000
20520406       1.0    q      040110000     1.0      q      040120000
20520407       1.0    q      040130000     1.0      q      040140000
20520408       1.0    q      040150000     -1000.   cntrlvar    2039
*====================================================================$
*  bypass power  (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520490     htrpow     function  0.001     17.4  1 0
*
*ctlvar    parameter         table
20520491   time    0          50
*====================================================================$
*  core bypass heat loss  (kW); accounts for power addition
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520500     byphlss    sum      -0.001     2.54326  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20520501   0.0  1.0   q      050010000      1.0     q      050020000
20520502        1.0   q      050030000      1.0     q      050040000
20520503        1.0   q      050050000      1.0     q      050060000
20520504        1.0   q      050070000      1.0     q      050080000
20520505        1.0   q      050090000      1.0     q      050100000
20520506       -1000. cntrlvar    2049
*====================================================================$
*  upper plenum heat loss  (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520620     uphloss    sum      -0.001     4.10173 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20520621   0.0  1.0   q      062010000      1.0     q      062020000
20520622        1.0   q      062030000      1.0     q      062040000
20520623        1.0   q      062050000      1.0     q      064010000
20520624        1.0   q      066010000      1.0     q      062080000
20520625        1.0   q      062090000      1.0     q      070010000
20520626        1.0   q      070020000
*====================================================================$
*  reactor heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20520800     rxhloss    sum       1.0      17.14827 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20520801   0.0  1.0   cntrlvar    2015      1.0     cntrlvar    2026
20520802        1.0   cntrlvar    2030      1.0     cntrlvar    2040
20520803        1.0   cntrlvar    2050      1.0     cntrlvar    2062
*====================================================================$
*  hot leg 1 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20521010     hl1hlss    sum      -0.001     1.93183 1 0
```

```
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20521011   0.0  1.0   q      101010000      1.0     q      101020000
20521012        1.0   q      101030000      1.0     q      101040000
20521013        1.0   q      101050000      1.0     q      101060000
20521014        1.0   q      101070000
*====================================================================$
*  pump suction 1 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20521350     ps1hlss    sum      -0.001     5.06786 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20521351   0.0  1.0   q      135010000      1.0     q      135020000
20521352        1.0   q      135030000      1.0     q      135040000
20521353        1.0   q      135050000      1.0     q      135060000
20521354        1.0   q      135070000      1.0     q      135080000
20521355        1.0   q      135090000      1.0     q      135100000
20521356        1.0   q      135110000      1.0     q      135120000
20521357        1.0   q      135130000      1.0     q      135140000
*====================================================================$
*  main coolant pump 1 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20521400     mcphlss    sum      -0.001     14.67846 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20521401   0.0  1.0   q      140010000
*====================================================================$
*  cold leg 1 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20521450     cl1hlss    sum      -0.001     1.84306  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20521451   0.0  1.0   q      142010000      1.0     q      145010000
20521452        1.0   q      145020000      1.0     q      145030000
20521453        1.0   q      145040000
*====================================================================$
*  primary loop 1 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20521500     lp1hlss    sum       1.0       23.5212  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20521501   0.0  1.0   cntrlvar    2101      1.0     cntrlvar    2135
20521502        1.0   cntrlvar    2140      1.0     cntrlvar    2145
*====================================================================$
*  sg1 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20521600     sg1hlss    sum      -0.001     11.2829  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20521601   0.0  1.0   q      170010000      1.0     q      170020000
20521602        1.0   q      170030000      1.0     q      170040000
20521603        1.0   q      170050000      1.0     q      172010000
20521604        1.0   q      175010000      1.0     q      175020000
20521605       -1000. cntrlvar 170
*====================================================================$
*  hot leg 2 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20522010     hl2hlss    sum      -0.001     1.935623 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20522011   0.0  1.0   q      201010000      1.0     q      201020000
20522012        1.0   q      201030000      1.0     q      201040000
20522013        1.0   q      201050000      1.0     q      201060000
20522014        1.0   q      201070000
*====================================================================$
*  pump suction 2 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20522350     ps2hlss    sum      -0.001     5.0804  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20522351   0.0  1.0   q      235010000      1.0     q      235020000
20522352        1.0   q      235030000      1.0     q      235040000
20522353        1.0   q      235050000      1.0     q      235060000
20522354        1.0   q      235070000      1.0     q      235080000
20522355        1.0   q      235090000      1.0     q      235100000
20522356        1.0   q      235110000      1.0     q      235120000
20522357        1.0   q      235130000      1.0     q      235140000
*====================================================================$
*  main coolant pump 2 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20522400     mcphlss    sum      -0.001     14.67838 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20522401   0.0  1.0   q      240010000
*====================================================================$
*  cold leg 2 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20522450     cl2hlss    sum      -0.001     1.84301  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20522451   0.0  1.0   q      242010000      1.0     q      245010000
20522452        1.0   q      245020000      1.0     q      245030000
20522453        1.0   q      245040000
*====================================================================$
*  primary loop 2 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20522500     lp2hlss    sum       1.0       23.5374  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20522501   0.0  1.0   cntrlvar    2201      1.0     cntrlvar    2235
20522502        1.0   cntrlvar    2240      1.0     cntrlvar    2245
*====================================================================$
*  sg2 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20522600     sg2hlss    sum      -0.001     11.28042  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20522601   0.0  1.0   q      270010000      1.0     q      270020000
20522602        1.0   q      270030000      1.0     q      270040000
20522603        1.0   q      270050000      1.0     q      272010000
20522604        1.0   q      275010000      1.0     q      275020000
20522605       -1000. cntrlvar 270
*====================================================================$
*  hot leg 3 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20523010     hl3hlss    sum      -0.001     1.93183 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20523011   0.0  1.0   q      301010000      1.0     q      301020000
20523012        1.0   q      301030000      1.0     q      301040000
20523013        1.0   q      301050000      1.0     q      301060000
20523014        1.0   q      301070000
*====================================================================$
*  pump suction 3 heat loss (kW)
```

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*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20523350     ps3hlss    sum      -0.001     5.09277  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20523351   0.0  1.0   q      335010000      1.0     q      335020000
20523352        1.0   q      335030000      1.0     q      335040000
20523353        1.0   q      335050000      1.0     q      335060000
20523354        1.0   q      335070000      1.0     q      335080000
20523355        1.0   q      335090000      1.0     q      335100000
20523356        1.0   q      335110000      1.0     q      335120000
20523357        1.0   q      335130000      1.0     q      335140000
*====================================================================$
*  main coolant pump 3 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20523400     mcphlss    sum      -0.001     14.6774  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20523401   0.0  1.0   q      340010000
*====================================================================$
*  cold leg 3 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20523450     cl3hlss    sum      -0.001     1.84293  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20523451   0.0  1.0   q      342010000      1.0     q      345010000
20523452        1.0   q      345020000      1.0     q      345030000
20523453        1.0   q      345040000
*====================================================================$
*  primary loop 3 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20523500     lp3hlss    sum       1.0       23.54493 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20523501   0.0  1.0   cntrlvar    2301      1.0     cntrlvar    2335
20523502        1.0   cntrlvar    2340      1.0     cntrlvar    2345
*====================================================================$
*  sg3 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20523600     sg3hlss    sum      -0.001     11.16849 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20523601   0.0  1.0   q      370010000      1.0     q      370020000
20523602        1.0   q      370030000      1.0     q      370040000
20523603        1.0   q      370050000      1.0     q      372010000
20523604        1.0   q      375010000      1.0     q      375020000
20523605       -1000. cntrlvar 370
*====================================================================$
*  hot leg 4 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20524010     hl4hlss    sum      -0.001     1.935756 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20524011   0.0  1.0   q      401010000      1.0     q      401020000
20524012        1.0   q      401030000      1.0     q      401040000
20524013        1.0   q      401050000      1.0     q      401060000
20524014        1.0   q      401070000
*====================================================================$
*  pump suction 4 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20524350     ps4hlss    sum      -0.001     5.07764 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20524351   0.0  1.0   q      435010000      1.0     q      435020000
20524352        1.0   q      435030000      1.0     q      435040000
20524353        1.0   q      435050000      1.0     q      435060000
20524354        1.0   q      435070000      1.0     q      435080000
20524355        1.0   q      435090000      1.0     q      435100000
20524356        1.0   q      435110000      1.0     q      435120000
20524357        1.0   q      435130000      1.0     q      435140000
*====================================================================$
*  main coolant pump 4 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20524400     mcphlss    sum      -0.001     14.6858  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20524401   0.0  1.0   q      440010000
*====================================================================$
*  cold leg 4 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20524450     cl3hlss    sum      -0.001     1.844066 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20524451   0.0  1.0   q      442010000      1.0     q      445010000
20524452        1.0   q      445020000      1.0     q      445030000
20524453        1.0   q      445040000
*====================================================================$
*  primary loop 4 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20524500     lp4hlss    sum       1.0       23.54327 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20524501   0.0  1.0   cntrlvar    2401      1.0     cntrlvar    2435
20524502        1.0   cntrlvar    2440      1.0     cntrlvar    2445
*====================================================================$
*  sg4 heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20524600     sg4hlss    sum      -0.001     11.11618 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20524601   0.0  1.0   q      470010000      1.0     q      470020000
20524602        1.0   q      470030000      1.0     q      470040000
20524603        1.0   q      470050000      1.0     q      472010000
20524604        1.0   q      475010000      1.0     q      475020000
20524605       -1000. cntrlvar 470
*====================================================================$
*  pzr surge line heat loss (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525050     pslhlss    sum      -0.001     .056419  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20525051   0.0  1.0   q      501010000      1.0     q      505010000
20525052        1.0   q      505020000      1.0     q      505030000
20525053        1.0   q      505040000      1.0     q      505050000
20525054        1.0   q      505060000      1.0     q      505070000
20525055        1.0   q      511010000      1.0     q      515010000
20525056        1.0   q      515020000      1.0     q      515030000
20525057        1.0   q      515040000      1.0     q      515050000
20525058        1.0   q      515060000      1.0     q      520010000
+               1.0   q      525010000
*====================================================================$
*  pzr heater power  (kW)
*====================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525300     htrpow     function  0.001     0.    1 0
```

```
*
*ctlvar    parameter         table
20525301   time    0         530
*======================================================================$
*  pzr heat loss (kW); accounts for heater power
*======================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525350     pzrhlss    sum      -0.001     7.89802  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20525351   0.0  1.0   q      530010000      1.0     q      530020000
20525352        1.0   q      530030000      1.0     q      530040000
20525353        1.0   q      530050000      1.0     q      530060000
20525354        1.0   q      530070000      1.0     q      530080000
20525355        1.0   q      535010000     -1000.   cntrlvar    2530
*======================================================================$
*  pzr and surge line heat loss (kW)
*======================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525400     tpzrlss    sum       1.0       7.95444 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20525401   0.0  1.0   cntrlvar    2505      1.0     cntrlvar    2535
*======================================================================$
*  total pump heat loss (kW)
*======================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525450     tmcplss    sum       1.0       58.7201 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20525451   0.0  1.0   cntrlvar    2140      1.0     cntrlvar    2240
20525452        1.0   cntrlvar    2340      1.0     cntrlvar    2440
*======================================================================$
*  total primary heat loss
*======================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525500     pcstot     sum       1.0       119.2495 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20525501   0.0  1.0   cntrlvar    2080      1.0     cntrlvar    2150
20525502        1.0   cntrlvar    2250      1.0     cntrlvar    2350
20525503        1.0   cntrlvar    2450      1.0     cntrlvar    2505
20525504        1.0   cntrlvar    2535
*======================================================================$
*  total primary heat loss without mcp and pzr (kW)
*======================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525550     tpcswo     sum       1.0       52.575  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20525551   0.0  1.0   cntrlvar    2550     -1.0     cntrlvar    2540
20525552       -1.0   cntrlvar    2545
*======================================================================$
*  total secondary heat loss
*======================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525600     scstot     sum       1.0       44.848  1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20525601   0.0  1.0   cntrlvar    2160      1.0     cntrlvar    2260
20525602        1.0   cntrlvar    2360      1.0     cntrlvar    2460
*======================================================================$
*  total primary and secondary heat loss (kw)
*======================================================================$
*ctlvar      name       type     factor    init   f c     min    max
20525650     prisec     sum       1.0       164.0975 1 0
*
*ctlvar    a0  coeff  var    parameter     coeff    var    parameter
20525651   0.0  1.0   cntrlvar    2550      1.0     cntrlvar    2560
*********************************************************************
*  STEADY STATE CONTROLLERS/COMPONENTS
*********************************************************************
*
* MCP controllers for loop flow rate
*--------------------------------------------------------------------
*20501390  lp1flerr  sum  1.0  -5.91028-9 0                 * sscalc
*20501391  2.3    -1.0 mflowj 143000000                     * sscalc
*20501400  mcp1spd   integral  10.0 39.0738 0  3  0.  400.  * sscalc
*20501401  cntrlvar 139                                     * sscalc
*
*20502390  lp2flerr  sum  1.0  -5.91648-9  0                * sscalc
*20502391  2.3    -1.0 mflowj 243000000                     * sscalc
*20502400  mcp2spd   integral  10.0 39.07494 0 3  0.  400.  * sscalc
*20502401  cntrlvar 239                                     * sscalc
*
*20503390  lp3flerr  sum  1.0  -5.79646-9 0                 * sscalc
*20503391  2.3    -1.0 mflowj 343000000                     * sscalc
*20503400  mcp3spd   integral  10.0 39.07394 0 3  0.  400.  * sscalc
*20503401  cntrlvar 339                                     * sscalc
*
*20504390  lp4flerr  sum  1.0  -6.28985-9  0                * sscalc
*20504391  2.4    -1.0 mflowj 443000000                     * sscalc
*20504400  mcp4spd   integral  10.0 40.4556 0  3  0.  400.  * sscalc
*20504401  cntrlvar 439                                     * sscalc
*
* Primary coolant system pressure control
*--------------------------------------------------------------------
*9050000   pressure   tmdpvol                              * sscalc
*9050101   1.0  0.1  0.0  0.0  0.0  0.0  0.0  0.0  10      * sscalc
*9050200   2                                               * sscalc
*9050201   0.0   16.855e6  1.0                             * sscalc
*
*9060000   prescon    sngljun                              * sscalc
*9060101   535010000  905000000  0.1  0.  0.  0000000      * sscalc
*9060201   0   -1.126522 -3.03643-4  0.                    * sscalc
*
* Pressurizer level control
*--------------------------------------------------------------------
*9100000   makeup   tmdpvol                                * sscalc
*9100101   1.0  0.1  0.0  0.0  0.0  0.0  0.0  0.0  10      * sscalc
*9100200   2   0   p 530010000                             * sscalc
*9100201    1.e5   1.e5  0.0                              * sscalc
*9100202   17.e6  17.e6  0.0                               * sscalc
*
*9110000   pzlvlctl tmdpjun                                * sscalc
*9110101   910010000  530000000  0.05                      * sscalc
*9110200   1   0   cntrlvar 9501                           * sscalc
*9110201   -10.0  -10.0   0.0   0.0                         * sscalc
*9110202     0.0    0.0   0.0   0.0                        * sscalc
*9110203    10.0   10.0   0.0   0.0                        * sscalc
*
*20595000  pzrlvler  sum  1.0  -2.17335-7 0                * sscalc
*20595001  6.99    -1.0 cntrlvar 532                       * sscalc
*20595010  pzrflow prop-int 1.0  -.001823546 0 3 -5.0 5.0 * sscalc
*20595011  1.0  1.0  cntrlvar 9500                         * sscalc
*
* Steam generator pressure controller
*--------------------------------------------------------------------
*
20500450  tcoldave  sum  0.25  559.7 1
20500451  0.0   1.0 tempf 145040000   1.0 tempf 245040000
20500452        1.0 tempf 345040000   1.0 tempf 445040000
*20597040  cltmperr  sum  1.0e5  .1903553  0               * sscalc
*20597041  559.7  -1.0 cntrlvar 45                         * sscalc
*20597050  stmvlv1p  prop-int  1.0  7117636. 0             * sscalc
*20597051  0.4   0.01  cntrlvar 9704                       * sscalc
```

```
*
* Steam generator level control
*---------------------------------------------------------------------
*1510200   1   0   cntrlvar 9151                           * sscalc
*1510201    0.0   0.0   0.0   0.0                         * sscalc
*1510202    5.0   5.0   0.0   0.0                         * sscalc
*
20501600  sg1level  sum  1.0  1.71     1
20501601  -0.017  0.476 voidf 170020000   0.476 voidf 170030000
20501602          0.476 voidf 170040000   0.374 voidf 170050000
20501603          0.630 voidf 172010000   0.470 voidf 175010000
20501604          0.235 voidf 175020000
*20591500  sg1lvler  sum  1.0  1.78624-7  0               * sscalc
*20591501  1.71  -1.0 cntrlvar 160                        * sscalc
*20591510  sg1flow   prop-int  1.0  .1666206 0 3 -5.0 5.0 * sscalc
*20591511  1.0  0.037  cntrlvar 9150                      * sscalc
*
*2510200   1   0   cntrlvar 9251                           * sscalc
*2510201    0.0   0.0   0.0   0.0                         * sscalc
*2510202    5.0   5.0   0.0   0.0                         * sscalc
*
20502600  sg2lvl01  sum  1.0  1.71     1
20502601  -0.017  0.476 voidf 270020000   0.476 voidf 270030000
20502602          0.476 voidf 270040000   0.374 voidf 270050000
20502603          0.630 voidf 272010000   0.470 voidf 275010000
20502604          0.235 voidf 275020000
*20592500  sg2lvler  sum  1.0  1.944328-7 0               * sscalc
*20592501  1.71  -1.0 cntrlvar 260                        * sscalc
*20592510  sg2flow   prop-int  1.0  .1666202 0 3 -5.0 5.0 * sscalc
*20592511  1.0  0.037  cntrlvar 9250                      * sscalc
*
*3510200   1   0   cntrlvar 9351                           * sscalc
*3510201    0.0   0.0   0.0   0.0                         * sscalc
*3510202    5.0   5.0   0.0   0.0                         * sscalc
*
20503600  sg3lvl01  sum  1.0  1.84    1
20503601  -0.017  0.476 voidf 370020000   0.476 voidf 370030000
20503602          0.476 voidf 370040000   0.374 voidf 370050000
20503603          0.630 voidf 372010000   0.470 voidf 375010000
20503604          0.235 voidf 375020000
*20593500  sg3lvler  sum  1.0  1.73368-8   0              * sscalc
*20593501  1.84  -1.0 cntrlvar 360                        * sscalc
*20593510  sg3flow   prop-int  1.0  .1666778 0 3 -5.0 5.0 * sscalc
*20593511  1.0  0.037  cntrlvar 9350                      * sscalc
*
*4510200   1   0   cntrlvar 9451                           * sscalc
*4510201    0.0   0.0   0.0   0.0                         * sscalc
*4510202    5.0   5.0   0.0   0.0                         * sscalc
*
20504600  sg4lvl01  sum  1.0  1.74    1
20504601  -0.017  0.476 voidf 470020000   0.476 voidf 470030000
20504602          0.476 voidf 470040000   0.374 voidf 470050000
20504603          0.630 voidf 472010000   0.470 voidf 475010000
20504604          0.235 voidf 475020000
*20594500  sg4lvler  sum  1.0  6.29914-8   0              * sscalc
*20594501  1.74  -1.0 cntrlvar 460                        * sscalc
*20594510  sg4flow   prop-int  1.0  .1738995 0 3 -5.0 5.0 * sscalc
*20594511  1.0  0.037  cntrlvar 9450                      * sscalc
*
*---------------------------------------------------------------------
*
.*
```